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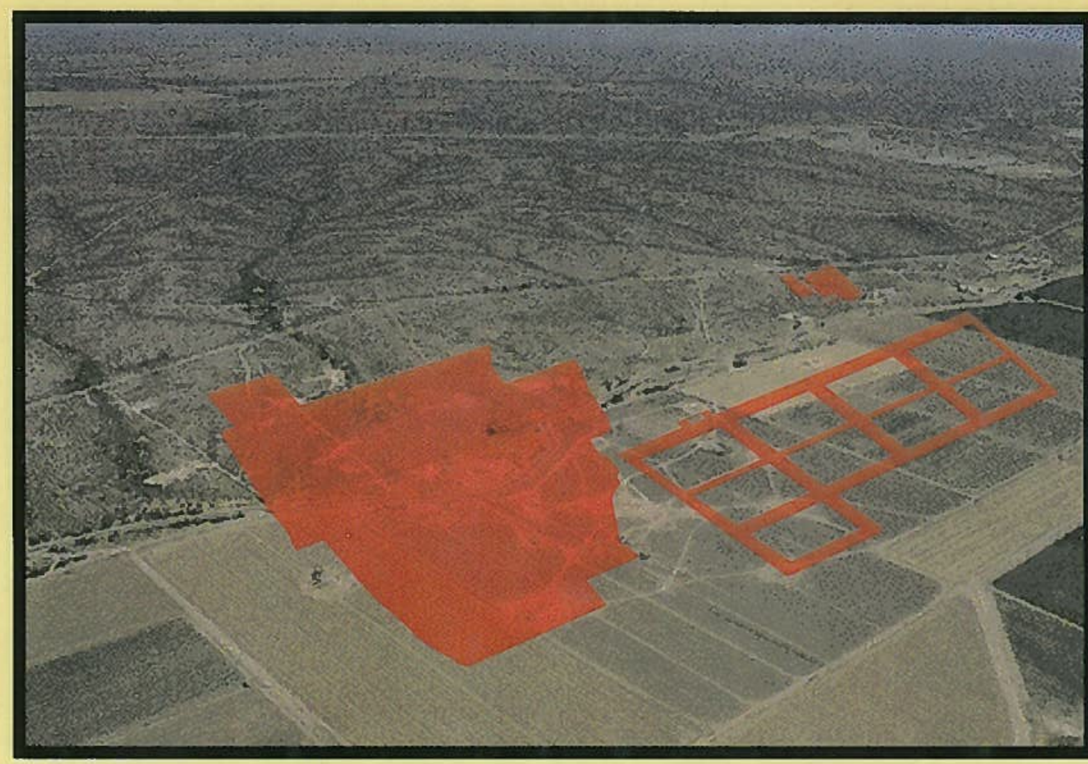

MAGMA FLORENCE IN-SITU PROJECT

Underground Injection Control Permit Application, Form 4 and Request for Minor Aquifer Exemption

January 1996

UNDERGROUND INJECTION CONTROL
PERMIT APPLICATION, FORM 4
AND
REQUEST FOR MINOR AQUIFER EXEMPTION

MAGMA FLORENCE IN-SITU PROJECT

JANUARY 1996

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FLORENCE PROJECT

January 19, 1996

Mr. Clyde Morris
Section Chief
Region IX
Environmental Protection Agency
75 Hawthorne Street
San Francisco, California 94105

15-1899/08/09

Subject: Aquifer Exemption Application and Underground Injection Control (UIC) Act Permit Application for the Magma Copper Company In-situ Leach Mine Florence, Arizona

Dear Mr. Morris:

At the instruction of Mr. Jose Luis Gutierrez, Project Officer for the Magma Copper Company (Magma) in-situ permits, Magma is hereby submitting the Aquifer Exemption Application for a minor exemption as per the requirements of 40 CFR 144-146. Also submitted is UIC Form 4 "UIC Permit Application", along with the required supplemental information.

Also included at the request of Mr. Gutierrez is Volume I of the Aquifer Protection Permit (APP) Application submitted on this same date to the Arizona Department of Environmental Quality (ADEQ), APP Mining Unit. Magma trusts that your staff will find the Aquifer Exemption and UIC Applications complete.

Magma would like to take this opportunity to commend you on the cooperation of your staff, and especially Mr. Gutierrez, in the preparation of these documents. Early on, it was recognized by Magma, the ADEQ, and the EPA that these applications paralleled sections of Arizona's APP Application. Through the suggestions and efforts of Mr. Gutierrez, and Ms. Shirin Tolle, APP Officer, Magma was able to organize the two permits at a substantial reduction of paper work and time. Ms. Tolle, as you are probably aware, is a Region IX EPA employee on temporary duty assignment to the ADEQ.

Magma has appreciated EPA attendance at joint Magma/ADEQ meetings, and in joint meetings with other interested parties.

Submitted with this letter are the following documents required by Mr. Gutierrez:

Volume I - UIC	Contains the Aquifer Exemption and UIC Applications.
Volume II	Site characterization. Volume II is the exact same volume for the UIC Application as the APP Application.
Volume III	Sampling and Analysis Plan. Same volume for UIC and Arizona APP Applications.

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14605 East Hunt Highway ■ Florence, Arizona 85232
(520) 868-5090 ■ FAX (520) 868-0463

Volume IV	Hydrogeological Modeling. Same volume for Arizona APP and UIC Application.
Volume V	Facility Design. Same volume for Arizona APP Application and UIC Application.
Volume I - APP	APP Application. Submitted at the request of Mr. Gutierrez.
Volume I - Appendix A	This appendix contains confidential business information submitted as part of the Aquifer Exemption Application. Magma claims confidentiality of this information under 40 CFR 144.5.

Magma is looking forward enthusiastically to working with Mr. Gutierrez and others on your staff over the next several months. This is a breakthrough project for Magma and the copper industry as a whole as this site would be the first fully-operational Class III copper in-situ mining of its type.

Congress, through its funding of the U.S. Bureau of Mines and the Santa Cruz Joint Venture In-situ Project Site in Arizona, has recognized that in-situ mining is an efficient way of meeting the needs of the nation for copper as a strategic metal, and yet doing so in a manner conducive to minimize environmental impacts on the land. Magma believes this mine to be the first of several of its type over the next years.

Sincerely,

John T. Kline

John T. Kline
Environmental Project Manager

JTK:kw
Enclosures

cc: Mr. Mike Eamon, Magma Copper Company
Mr. Jose Gutierrez, U.S. Environmental Protection Agency
Mr. Charles Taylor, Magma Copper Company
Ms. Shirin Tolle, Arizona Department of Environmental Protection

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To clarify several technical and modeling terms in this application, Magma has prepared the glossary presented on the following pages.

Alert Level: A numeric value, expressing either a concentration of a pollutant or a physical or chemical property of a pollutant, which is established in an individual Aquifer Protection Permit and which serves as an early warning indicating a potential violation of either an AWQS at the applicable point of compliance, or any permit condition.

Alteration: Any change in the mineralogic composition of a rock brought about by physical or chemical means, especially by the action of hydrothermal solutions; also, a secondary, i.e. supergene, change in a rock or mineral.

Anion: A negatively charged ion (as a hydroxide, chloride, or acetate ion): the ion in an electrolyzed solution that migrates to the anode and is there discharged and liberated or deposited.

Application Verification: Using the set of parameter values and boundary conditions from a calibrated model to verify a second set of field data measured under similar hydrologic conditions.

Aquifer: A geologic unit that contains sufficient saturated permeable material to yield usable quantities of water to a well or spring (A.R.S. § 49-201.2). The Aquifer Boundary and Protected Use Classification Rules (A.A.C. R18-11-501.4) have defined "usable quantities" at 5 gallons per day (gpd).

Aquifer: An aquifer is defined (40 C.F.R. §144.3) as a geological formation, group of formations, or part of a formation which is capable of yielding a significant amount of water to a well or spring.

Aquifer Protection Permit: An individual or general permit issued pursuant to A.R.S. § 49-221 and 49-223.

Aquifer Water Quality Standards (AWQS): AWQS represent maximum allowable concentrations of a contaminant in surface water or groundwater. AWQS are in numeric and narrative form. Narrative standards as set forth in A.A.C. R18-11-405 prohibit discharges which (a) cause a pollutant to be present in an aquifer classified for drinking water protective use in a concentration which endangers human health, (b) cause or contribute to a violation of surface water quality standard established for navigable waters of the state, or (c) cause a pollutant to be present in an aquifer which impairs existing or reasonably foreseeable uses of water in an aquifer. Numeric standards are set forth in A.A.C. R18-11-406.

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Atterberg Limits: In a sediment, the water-content boundaries between the semiliquid and plastic states (known as the liquid limit) and between the plastic and semisolid states (known as the plastic limit).

BADCT: The best available demonstrated control technology, processes, operating methods, or other alternatives to achieve the greatest degree of discharge reduction determined for a facility by the Director pursuant to A.R.S. § 49-221 and 49-223.

Calibration: The process of refining the model representation of the hydrogeologic framework, hydraulic properties and boundary conditions to achieve a desired degree of correspondence between the model simulations and observations of the groundwater flow system.

Cation: A positively charged ion (as a hydrogen, calcium, or ammonium ion). The ion in an electrolyzed solution that migrates to the cathode and is there discharged and liberated or deposited.

Chemical Transport: Chemical transport involves further refinement of the groundwater flow model to include simulation of chemical movement and distribution in a groundwater flow system. Chemical transport modeling includes diffusion, dispersion, chemical decay and reactions between the chemical and the porous media.

Conceptual Model: An interpretation or working description of the characteristics and dynamics of the physical system. Conceptualizing the hydraulic system is one of the most important parts of the modeling process. Before a mathematical model can be developed, a conceptual model involves identifying all of the inflows, outflows and hydraulic stresses on the aquifer system.

Constant Flux Boundary: A numerical boundary condition in MODFLOW through which the inflow or outflow flux of groundwater remains constant, and does not vary due to changing groundwater flow gradients.

Discharge: Defined as the addition of a pollutant from a facility either directly to an aquifer or to the land surface or the vadose zone in such a manner that there is a <u>reasonable probability</u> that the pollutant will reach an aquifer (A.R.S. § 49-201.10).

Discharge Impact Area (DIA): The "potential areal extent of pollutant migration, as projected on the land surface, as the result of a discharge from a facility." (A.R.S. § 49-201.12). The perimeter of the DIA is the point at which pollutant concentrations are diluted to a level indistinguishable from background concentrations by standard test methods.

Enrichment: The supergene processes of mineral deposition, including near-surface oxidation, downward migration, and precipitation, e.g. sulfide enrichment.

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Facility: Any land, building, installation, structure, equipment, device, conveyance, area, source, activity or practice from which there is, or with reasonable probability may be, a discharge (A.R.S. § 49-201.15).

Flow Line: Is a representation of the direction of groundwater flow. Flow lines are always perpendicular to lines of equal groundwater elevation. Flow lines only converge in areas of groundwater discharge or recharge. A groundwater particle trace or pathline is the actual tortuous paths of the water molecules as they flow through pores, cracks and crevices of the soil or other aquifer material.

Freeboard: (a) The additional height that is above the recorded or design high-water mark of an engineering structure (such as a dam, seawall, flume, or culvert) associated with a body of water and that represents an allowance against overtopping by transient disturbances. (b) The vertical distance between the water level at a given time and the top of an engineering structure, such as the distance between the normal operating level of a reservoir and the crest of the associated dam.

General Head Boundary: The general head boundary is a numerical constraint in MODFLOW that simulates regional flow beyond the finite difference grid. The general head boundary will adjust the flux of water in or out of the model depending on simulated groundwater flow gradients.

Granodiorite: A group of coarse-grained plutonic rocks intermediate in composition between quartz diorite and quartz monzonite, containing quartz, plagioclase (oligoclase or andesine), and potassium feldspar, with biotite, hornblende, or more rarely, pyroxene, as the mafic components. The ratio of plagioclase to total feldspar is at least 2 to 1 but less than 9 to 10. With less alkali feldspar it grades into quartz diorite, and with more alkali feldspar, into granite or quartz monzonite.

Gravity Anomaly: The difference between the observed value of gravity at a point and the theoretically calculated value is based on a simple gravity model, usually modified in accordance with some generalized hypothesis of subsurface density variation as related to surface topography.

Hydraulic Conductivity: Hydraulic conductivity describes the ease with which water can pass through an aquifer. The hydraulic conductivity multiplied by the thickness of the aquifer is equal to the transmissivity.

Hydraulic Gradient: (a) In an aquifer, the rate of change of pressure head per unit of distance of flow at a given point and in a given direction. (b) In a stream, the slope of the hydraulic grade line.

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Hydraulic Head: (a) The height of the free surface of a body of water above a given subsurface point. (b) The water level at a point upstream from a given point downstream. (c) The elevation of the hydraulic grade line at a given point above a given point of a pressure pipe.

Hydrothermal: Of or pertaining to heated water, to the action of heated water, or to the products of the action of heated water, such as a mineral deposit precipitated from a hot aqueous solution, with or without demonstrable association with igneous process (also, said of the solution itself).

Hydrothermal Alteration: Alteration of rocks or minerals by the reaction of hydrothermal water with pre-existing solid phases.

Injection Well: A well which receives a discharge through pressure injection or gravity flow.

Modflow: The United States Geologic Survey (USGS) Modular Three-Dimensional Finite Difference Groundwater Flow Model. By McDonald and Harbaugh, 1988.

MT3D: A Modular Three-Dimensional Finite Difference Chemical Transport Model. By Chunmiao Zheng (Papadopulos and Associates), 1990.

Oxide: A mineral compound characterized by the linkage of oxygen with on metallic element, such as cuprite, Cu_2O, rutile, TiO_2, or spinel, $MgAl_2O_4$.

Oxidized Zone: An area of mineral deposits modified by surface waters, e.g. sulfides altered to oxides and carbonates.

PATH3D: A Ground-Water Path and Travel-Time Simulator. By Chunmiao Zheng (Papadopulos and Associates) 1992. A general particle tracking program for calculating groundwater paths and travel times in steady-state or transient two- or three-dimensional flow fields.

Particle Tracking: A technique is used to trace out flow paths, or pathlines, by tracking the movement of infinitely small imaginary particles placed in the groundwater flow field. Particle tracking is primarily used to understand the transient movement of groundwater flow and calculate groundwater travel times.

Point of Compliance (POC): Defined as a vertical plane downgradient of the facility that extends through the uppermost aquifer(s) underlying the facility (A.R.S. § 49-244). AWQS may not be violated at the POC as a result of discharge from the facility. If a pollutant already violates an AWQS at the POC, a discharge cannot cause further degradation of the aquifer at the POC by that pollutant (A.R.S. § 243.B.3). Separate POC may be defined for hazardous and non-hazardous substances. For hazardous substances, the POC is the limit of the pollutant management area (the area on which pollutants are or will be placed), which can include dams, dikes or other retaining structures (A.R.S. § 49-244.1). An alternate hazardous POC may be designated if it is demonstrated that it is technically impractical to monitor at the downgradient edge of the pollutant management area, or that an alternative POC will allow installation and operation of the monitoring facilities at substantially lower cost (A.R.S. § 49-244.2). It must, however, be located in the downgradient direction no further from the source of discharge than 750 feet or the property boundary, whichever is closer. A non-hazardous POC must be located as to ensure protection for current and reasonably foreseeable future uses of the aquifer (A.R.S. § 49-244.3).

Porosity: Porosity is the amount of void space between soil or rock particles, and reflects the ability of the aquifer to store water.

Porphyry: An igneous rock of an composition that contains conspicuous phenocrysts in a fine-grained groundmass; a porphyritic igneous rock.

Porphyry Copper: A copper deposit in which the copper-bearing minerals occur in disseminated grains and/or in veinlets through a large volume of rock. Today, the term implies a large low-grade disseminated copper deposit which may be also in schist, silicated limestone, and volcanic rocks, but quartz-bearing igneous rocks are always in close association.

Public Water System: A public water system is defined (40 C.F.R. §142.2(k)) as a system for the provision to the public of piped water for human consumption, if such system has at least 15 service connections or regularly serves an average of at least 20 individuals daily at least 60 days out of the year.

Quartz Monzonite: Granitic rock in which quartz comprise 10 percent to 50 percent of the felsic constituents, and in which the alkali feldspar/total feldspar ratio is between 35 percent and 65 percent; the approximate intrusive equivalent of rhyodacite. With an increase in plagioclase and femic minerals, it grades into granodiorite, and with more alkali feldspar, into a granite.

Sewage: Wastes from toilets, baths, sinks, lavatories, laundries, and other plumbing fixtures in residences, institutions, public and business buildings, mobile homes, watercraft, and other places of human habitation, employment, or recreation.

Sewage Disposal System: A system for sewage collection, treatment, and discharge by surface or underground methods.

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Substances, Hazardous: Substances defined as hazardous under various laws and regulations, including:

- Any substance designated pursuant to §§311(b)(2)(a) and 307(a) of the Clean Water Act.
- Any element, compound, mixture, solution or substance designated pursuant to §102 of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).
- Any hazardous waste having the characteristics identified under or listed pursuant to §49-922.
- Any hazardous air pollutant listed under §112 of the Federal Clean Air Act (42 United States Code §7412).
- Any imminently hazardous chemical substance or mixture with respect to which the administrator has taken action pursuant to §7 of the Federal Toxic Substances Control Act (15 United States Code §2606).
- Any substance which the director of the Arizona Department of Environmental Quality, by rule, either designates as a hazardous substance.

Sulfide: A mineral compound characterized by the linage of sulfur with a metal or semimetal, such as galena, PbS, or pyrite, FeS_2.

Sulfide Zone: An area of enrichment of sulfide deposits that have not yet been oxidized by near-surface waters.

Supergene: A mineral deposit or enrichment formed by descending solutions; also, refers to those solutions of that environment.

Surface Impoundment: A pit, pond or lagoon, having a surface dimension that is equal to or greater than its depth, which is used for the storage, holding, settling, treatment or discharge of liquid pollutants or pollutants containing free liquids.

Storativity/Specific Yield: Storativity and specific yield are related parameters. Storativity is defined as the amount of water released or added to storage per change in pressure due to pumping or recharge in a confined aquifer. Specific yield is the percentage of water that would drain from a unit volume of aquifer material (i.e., 1 cubic foot) in an unconfined aquifer. For coarse sands and gravel, the specific yield is roughly equal to the porosity. Storativity and specific yield control the time it will take for changes in pumping or recharge to propagate throughout the aquifer system.

Temporary Cessation: Any cessation of operation of a facility for a period of greater than 60 days but which is not intended to be permanent.

Transmissivity: In an aquifer, the rate at which water of the prevailing kinematic viscosity is transmitted through a unit width under a unit hydraulic gradient. Though spoken of as a property of the aquifer, it embodies also the saturated thickness and the properties of the contained liquid.

Underground Source of Drinking Water (USDW): A USDW is defined at 40 C.F.R. §144.3 as an aquifer or its portion which:

1. a. supplies any public water system; or
   b. contains sufficient quantity of groundwater to supply a public water system; and

      (1) currently supplies drinking water for human consumption; or
      (2) contains fewer than 10,000 milligrams per liter (mg/L) total dissolved solids (TDS); and

2. is not an exempted aquifer.

Vadose Zone: A subsurface zone containing water under pressure less than that of the atmosphere, including water held by capillarity; and containing air or gases generally under atmospheric pressure. This zone is limited above by the land surface and below by the surface of the zone of saturation, i.e. the water table.

Zone of Saturation: A subsurface zone in which all the interstices are filled with water under pressure greater than that of the atmosphere. Although the zone may contain gas-filled interstices or interstices filled with fluids other than water, it is still considered saturated. This zone is separated from the zone of aeration by the water table.

SECTION 1.0

INTRODUCTION

1.1 PURPOSE

The Magma Copper Company (Magma) is herewith submitting to the United States Environmental Protection Agency (EPA), Region 9, the enclosed Underground Injection Control (UIC) Permit Application, Form 4, and a related request for a minor aquifer exemption. The EPA approvals will enable Magma to proceed with the development and operation of an in-situ copper mining operation near Florence, Arizona.

Magma has also submitted a five-volume application for an Aquifer Protection Permit (APP) to the Arizona Department of Environmental Quality (ADEQ). Approval of the APP will also be required before Magma may proceed with its Florence Project.

1.2 ORGANIZATION

This document contains both the request for a minor aquifer exemption and the UIC Permit Application. General facility information applicable to Form 4 and the exemption request is presented in Section 1.3 below.

Information that explains and supports the request for minor aquifer exemption is provided in Section 2.0. The Region 9 Aquifer Exemption Guidance Manual dated March 1993 was used in the development of Section 2.0 and in the development of the aquifer exemption checklist which is provided in Section 2.0.

Section 3.0 includes the UIC Permit Application Form 4. It also includes a checklist that provides a cross-reference to information supporting the application. Items presented in the checklist are listed in order of the attachments specified under Item XI of Form 4.

Much of the information presented in this volume or referenced in the checklists is found in Volumes II through V of the APP Application. To ensure that both the EPA and the ADEQ have the same information, Magma has provided copies of the five-volume APP Application to Region 9, EPA and has provided copies of this volume to ADEQ.

1.3 GENERAL FACILITY INFORMATION

Magma Copper Company (Magma) refers to the proposed facility as the Florence Project. The following serves as both the facility address and mailing address:

> Magma Copper Company
> Florence Project
> 14605 East Hunt Highway
> Florence, Arizona 85232

For correspondence concerning this application, the facility contact person is:

Mr. John Kline
Magma Copper Company
14605 East Hunt Highway
Florence, Arizona 85232
Telephone Number: (520) 868-5094
FAX Number: (520) 868-0463

The required information in regards to the responsible party for the Florence Project is presented below:

Owner of Operation:	Magma Copper Company Suite 200 7400 North Oracle Road Tucson, Arizona 85704 Telephone Number: (520) 575-5600 FAX Number: (520) 575-5639
Operator:	Magma Copper Company Florence Project 14605 East Hunt Highway Florence, Arizona 85232 Telephone Number (520) 868-5094 FAX Number: (520) 868-0463

2

SECTION 2.0

REQUEST FOR MINOR AQUIFER EXEMPTION

2.1 NEED FOR EXEMPTION

Magma requests the proposed minor aquifer exemption in order that the Environmental Protection Agency (EPA) may proceed with the review and approval of Magma's UIC application for an area permit. The requested permit will enable Magma to develop a facility to recover copper from the orebody that lies below the water table.

The copper will be extracted by use of in-situ leach mining methods. In-situ mining is a technically and economically viable approach, and allows the mining to be conducted with minimal land disturbance. Normal open-pit mining was considered, but is not a preferred alternative as it produces a sizable land disturbance and provides a lower economic outcome.

The area for which the exemption is requested covers the areal extent of the orebody (about 300 acres) and buffer zone extending 1/2-mile outward. There is no other area which could be considered for mining the orebody.

The proposed injection zone is not now used as source of drinking water and will not be used as a source of drinking water during the 15-year life of the mine. Simulation models were used to evaluate the impacts of the proposed mining operation. The models indicate that the proposed mining operation will not interfere with known or reasonably foreseeable sources of drinking water and as such meets the requirements of 40 C.F.R. 146.4 (a). Information presented in Appendix A of this volume demonstrates the economic viability of the proposed mining operation and establishes the economic justification for the exemption in accordance with 40 C.F.R. 146.4 (b)(1). Appendix A includes operating costs, capital costs, and profitability numbers, that is released, may cause loss of competitive advantage in the sale and revenues of the copper produced at Florence.

The economic justification in Appendix A of this volume includes information that is considered confidential, and is marked with the words "CONFIDENTIAL BUSINESS INFORMATION" in compliance with 40 C.F.R. 144.5.

Information included in the application and attached volumes further explain the need for the exemption and the potential impact of this relatively small site within the 100-square-mile impact study area.

Magma submits the application to mine the in-situ resource in compliance with regulatory goals to reduce waste and minimize pollution. In-situ leaching will leave virtually no impact on the surface of the land after closure when compared to other mining methods.

2.1.1 Exempted Aquifer (40 C.F.R. 144.7)

The area for which Magma is requesting exemption includes the copper mineralized zone shown in the attached plan view (Sheet 2.1-1 [UIC]). Two typical cross sections are shown that illustrate the outline of the orebody. The orebody is located approximately 350 to 1,240 feet below land surface. Figure 2.1-1 (UIC) is a typical east-west section and Figure 2.1-2 (UIC) is a typical north-south section. Magma is requesting a minor exemption that extends horizontally outward from the orebody 1/2 mile. The planned production schedule includes the copper extraction rate for the life of the mine.

2.2 FACILITY DATA

2.2.1 Location

The 213-acre in-situ mine area is located approximately 1 mile west/southwest of Poston Butte and 2 miles northwest of Florence, Arizona (as shown on Sheet 2.1-1 [UIC]). The Gila River trends west-southwest and is located approximately 1/2 mile south of the mine area.

2.2.2 Prior and Existing Uses

Magma purchased the mine property from Conoco Oil Company in 1992. Conoco operated the underground mine during the 1970s but ceased activities by 1975. Magma controls the uses of the water within the proposed boundary. The mine site and the few homes associated with Magma's drilling and farming operations use imported bottled water and not well water for drinking due to excessive nitrate levels in the water. The area will not be used for drinking water in the future as Magma owns or controls the land.

Three irrigation wells are located on the mine site. Two of these wells are used by the San Carlos Irrigation and Drainage District (SCIDD) and discharge to the North Side Canal. The remaining installation is utilized by local farmers and discharges into small irrigation ditches. The wells are generally located near the center of the site along the SCIDD Canal. Tables 2.2-1 and 2.2-2 provide the addresses of the property owners in the area and contains more information related to these wells. Use of irrigation wells that could potentially interfere with leaching operations will either be closed or relocated to other areas of Magma's 10,000-acre property.

2.2.3 General Surface Conditions

The project site is located on both agricultural and undisturbed land. It is at a nominal elevation of 1,475 feet above sea level. The elevation of the site declines approximately 25 feet from north to south. At least three river terraces are present on the site. These terraces mark past base levels and northern extent of the active channel of the Gila River. The northern-most extent of the active floodplain is currently located approximately 1/4 mile south of the mine site.

The surface of the project site can be divided into two segments based on land usage. As depicted in Figure 2.2-1 (UIC), this division occurs approximately where the San Carlos Irrigation and Drainage District (SCIDD) North Side Canal traverses the property. The southern portion is dominated by agricultural activities, whereas the northern portion has remained relatively undisturbed desert land. Numerous archaeological sites exist in the northern portion. Primary disturbances north of the canal consist of dirt roads. These roads provide access from Hunt Highway to adjacent agricultural and mine-related areas. The Southern Pacific Railroad also passes north of the proposed site.

2.3 AQUIFER DATA

2.3.1 Description of the Regional Groundwater System

The Arizona Department of Water Resources (ADWR) has divided the saturated materials within the area into four main hydrogeologic units. The Upper Alluvial Unit is analogous to the Upper Basin-Fill Unit (UBFU) referenced in this report. The Middle Silt and Clay Unit is analogous to the Middle Fine-Grained Unit (MFGU), and separates the UBFU and Lower Basin-Fill Unit (LBFU). The Lower Conglomerate Unit is analogous to the LBFU referenced in this report. The Hydrologic Bedrock Unit is similar to the bedrock zones referenced in this report.

The Upper Alluvial Unit consists mainly of unconsolidated to slightly consolidated, interbedded gravels, sands and silt, with some finer-grained materials existing as lenses. The lower half to one-third of this unit is a transition zone containing interbedded-coarse and fine-alluvial material typical of the underlying Middle Silt and Clay Unit. The upper alluvial unit is a significant aquifer throughout the area, with well yields that have been reported up to 3,000 gallons per minute (gpm).

The Middle Silt and Clay Unit generally separates the upper basin-fill from the lower basin-fill. This fine-grained unit is reported to be laterally extensive throughout the basin. Near the margins of the basins, this unit may not be distinguishable from the overlying or underlying materials. The Middle Silt and Clay Unit is known for groundwater production in and of itself in the Eloy sub-basin. The middle alluvial unit has been intercepted during drilling at the in-situ mine area, and has been identified on off-site water well logs for wells within the 100-square mile Florence Project Area (see Sheet 2.1-1 [UIC]).

The Middle Silt and Clay Unit has been divided into two sub-units (Hardt and Chattany, 1965). The uppermost sub-unit consists of about 90 percent clay with intermittent gravel and sand lenses. This sub-unit has been described in core and water well logs throughout the study area as presented in Volume II of the Aquifer Protection Permit Application. The lower fine-grained sub-unit is the thickest and is found in deeper areas of the basin where which it may exceed 3,000 feet in thickness (Hardt and Chattany, 1965). It is predominantly an evaporite unit consisting of anhydrite with minor clay and silt. This sub-unit has been identified to the north and northeast of the proposed mine site, but not within 3 miles of the site.

Beneath the Middle Silt and Clay Unit is the Lower Alluvial Unit. This unit is also known as the Lower Conglomerate Unit, as reported by Montgomery (1994) and Conoco (1976). It is the deepest alluvial unit in the Eloy basin and was intercepted during current investigation drilling activities. The lithology of the Lower Alluvial Unit is characterized by semi-consolidated to consolidated coarse sediments consisting of granite fragments, cobbles, boulders, sands, and gravels.

The Lower Alluvial Unit locally produces groundwater. In many cases, yields from wells penetrating the lower basin-fill can exceed 1,000 gpm and can be as large as 2,500 gpm (Montgomery, 1994). Where the lower basin-fill occurs directly beneath the middle fine-grained unit, groundwater may exist under confined or semi-confined conditions. Where the Lower Alluvial Unit is in direct contact with the Upper Alluvial Unit groundwater exists under generally unconfined conditions.

The Lower Alluvial Unit rests on fractured and faulted bedrock. The bedrock consists of Precambrian granite, gneiss, and schist. The bedrock is considered to be impermeable and non water-bearing compared to the basin-fill units, but is reported to be locally permeable in areas where it is highly fractured. Many wells completed in the area are screened in the basin-fill units as well as the bedrock.

2.3.2 Groundwater Use

Based on ADWR records through May, 1995 (ADWR, 1995), there are 382 registered wells within the 100-square mile Florence Project Area. Sheets 2.1-1 (UIC) and 2.1-2 (UIC) show the locations of these wells. As presented in Table 2.3-1, these wells are used for irrigation, domestic, public water supply, and monitoring purposes. Agricultural and municipal entities are the primary consumers of groundwater in the project area.

Water well data (ADWR, 1995) are more concentrated east and west of the Florence Project Area where the thickness of the basin-fill units is greater. With the exception of the Gila River channel area, water well log coverage is significant south of the Florence Project Area. However, wells in this area are generally less than 500 feet deep and do not encounter bedrock. Very few water wells are located within 2 miles north of the Florence Project Area. This area does contain exploration coreholes. Sheet 2.1-1 (UIC) shows locations of water wells with available logs and other information.

2.3.3 Community Drinking Water Systems

The Town of Florence owns five public supply wells in the general vicinity of the Florence Project area. Two wells are located approximately 2 1/2 miles east of the Florence proposed in-situ mine area at Florence Gardens. Three wells are located in the Town of Florence, approximately 3 miles southeast of the mine area (see Sheet 2.1-1 [UIC]). The three wells located in the Town of Florence provide drinking water to the residents and businesses of Florence. The two wells located at Florence Gardens provide drinking water to the residents of Florence Gardens, the Air National Guard (ANG), and the Immigration and Naturalization Service (INS).

The Arizona Department of Corrections owns two water supply wells; one located approximately 2 1/2 miles south, and one located approximately 3 miles east of, the proposed in-situ mine area (see Sheet 2.1-1 [UIC]). These wells provide drinking water to approximately 4,200 inmates at the Florence Complex of the Arizona State Prison. The majority of privately owned domestic wells are located outside of the Florence Project Area region serviced by the Town of Florence, in rural areas to the south of the project area. Tables 2.3-1 and 2.3-2 present additional information concerning these wells.

Table 2.3-3 summarizes large municipal water providers in the Pinal AMA (ADWR, 1995). Of the providers listed in Table 2.3-3, the Arizona State Prison at Florence and the Town of Florence are within 5 miles of the proposed in-situ mine area (see Sheet 2.1-1 [UIC]). Groundwater pumped from wells in 1985 which serve these two entities, as presented in Table 2.3-3, consist of 1,055 acre/feet (ac-ft) and 1,284 ac-ft, respectively.

2.3.4 Agricultural Withdrawals

The majority of groundwater reported in Table 2.3-4 is used by SCIDD, which is an element of San Carlos Irrigation Project (SCIP). SCIP is the primary user of surface water diverted from the Gila River and groundwater pumped from the area. The other primary element of SCIP is Gila River Indian Community (GRIC). Approximately 80 percent of the land in the region is used for agriculture (Beer, 1988). The main crop is cotton which is watered using flood irrigation methods. Approximately 12 percent of the farmers in the area use groundwater from private wells. The remaining farms utilize surface water supplied by SCIDD through three canals; the Florence-Casa Grande Canal, the North Side Canal, and the Florence Canal.

2.3.5 Nearby Property Owners

There are only two property owners within the 1/2-mile exemption boundary other than Magma. Sheet 2.1-1 (UIC) shows that ASARCO, Inc., another mining company, has a portion of their land that lies to the west of the proposed in-situ mine site. There are no wells of any type found on that land.

A portion of land owned by the State of Arizona lies in the south half of Section 28 of Township 4 South, Range 9 East. This land is leased to Magma under Mineral Lease 11-26500. Another portion of State of Arizona land lies in the northeast corner of the proposed exemption area. Again, there are no wells on that land either.

The San Carlos Irrigation District (SCID) has two irrigation wells located inside the 1/2-mile exemption area. These wells will be closed and replaced outside of the exemption area prior to mining operations.

2.4 PROJECT TYPE - AREA PERMIT FOR CLASS III WELLS

Magma plans to commence facility construction in March 1997 and to ship the first copper in January 1998. Operations are expected to continue for approximately 15 years.

2.4.1 In-Situ Mining Process

Magma proposes to mine copper at the facility using an in-situ leaching process. The process involves the following principal components:

- A series of injection wells to inject diluted sulfuric acid into selected segments of the copper oxide orebody.

- A series of recovery wells to recover copper sulfate solutions from the orebody.

- A series of hydraulic control wells to prevent production fluids from entering the surrounding aquifer.

- A solvent extraction/electrowinning (SX/EW) plant to recover copper from the production fluids.

- A neutralization unit to neutralize raffinate (spent sulfate solutions).

- An evaporation/tailing impoundment to contain and evaporate neutralized raffinate.

- An impoundment to collect stormwater and or spills.

- Fuel and chemical storage tanks.

A detailed description of the operational components associated with the proposed in-situ facility are presented in Volume V of this application.

The classification of the wells will be Class III. There will be 2,000 to 3,000 wells drilled and used during the expected 15-year mine life; therefore, this is an application for an area permit as described in 40 C.F.R. 144.33. The project type is extraction of copper. The classification of wells is described in 40 C.F.R. 144.6 (c) (2).

2.4.2 Injection/Withdrawal Practices

For purposes of this application, the analysis of the production well field contains an array of design, operational and closure components, and an evaluation of the alternatives related to these components. These environmental control aspects are coupled with the opportunity to optimize resource recovery throughout the life of the project.

Magma has developed a reference design that incorporates the most advanced discharge control technologies (DCTs) commercially available. Many of these technologies have been demonstrated to be effective in controlling fluid migration in related industrial applications, including oil and gas resource recovery, construction dewatering, and groundwater remediation. These cross-over technologies are only applicable to the acidified solution recover of oxide copper reserves of the subject orebody by recognizing the site specific hydrogeologic conditions of the Florence site, and the chemical and physical characteristics of the process fluids. In recognition of these factors, Magma has developed a design, operational approach and closure strategy that demonstrates the ability to meet the requirements of Underground Injection Control (UIC) regulations.

The Magma Florence oxidized copper orebody lies below the water table. The orebody is slated for in-situ leach extraction of its metallic values through deep well injection of acidified raffinate and pumped well recovery peripheral to the point of injection. Therefore, key elements of the

Magma Florence in-situ operations plan include: (1) hydraulic control to prevent excursions beyond the perimeter of the mined area; (2) corrective actions to prevent existing boreholes from becoming conduits for acidified process fluids; and (3) the proper design, construction and operation of the well system, including applicable verification of through mechanical integrity testing. Equally important is the close-as-you-go concept which is discussed in Section 2.7.

2.4.3 Operating Status of Injection/Extraction Wells

There are no operating wells at this time.

2.5 LISTING OF ALL US ENVIRONMENTAL PROTECTION AGENCY (USEPA) PERMITS OR CONSTRUCTION APPROVALS

Magma's Florence mine is not yet in operation and, as such, has few permits. Information presented in Table 2.5-1 shows the status of permits listed.

Permit requirements for Florence include an Aquifer Protection Permit (APP) from Arizona Department of Environmental Quality (ADEQ). In addition, an Air Quality Permit from Pinal County for the boilers, metal furnaces, and dust collection system for the processing plant will be required. The Arizona State Land Department will require a Mine Plan of Operation for those areas of the in-situ leaching that will occur on State lease land. Mineral lease 11-26500 is in place, but the current Mine Plan of Operations covers only exploration drilling. The ADWR will require permits for injection wells, monitor wells, and hydraulic control wells.

Under 40 C.F.R. Part 144 of the Safe Drinking Water Act (SDWA), the in-situ operation must be approved prior to operation for an aquifer exemption and a Class III Underground Injection Control (UIC) Permit issued. Under the UIC Permit program, the mine will have to show compliance with the Endangered Species Act (ESA), National Historic Preservation Act (NHPA), and the Fish and Wildlife Coordination Act (FWCA).

2.6 WATER QUALITY IMPACTS

Potential impacts on groundwater quality have been carefully evaluated and described in Magma's APP application. Section 5.0, Volume I, of the APP Application provides a brief overview of those evaluations and is attached to this application as Appendix B. As described therein, state-of-the-art models were used to evaluate the potential impacts of the proposed in-situ mining operation. the models indicate that drinking water quality standards will be maintained at the boundaries of the in-situ mine area during operations and during the 30-year post-closure period.

2.7 ANALYSES OF ENVIRONMENTAL IMPACTS AND COMMITMENT OF RESOURCES

Magma Copper Company's (Magma) policy is to effect closure on an on-going basis during operation. Once a series of wells has depleted an ore zone of copper, closure will begin in phases expected to last about 18 months each. The closure process will begin with a period where only injection occurs without acid being added. This period will be followed by a rest period of about 1 week to 1 month, depending on the acid consumption residual in the leach ore. The solutions will then be withdrawn without injection. Withdrawal will continue until the copper and acid values drop to a low level in the solutions pumped from the spent orebody. There may then be a period where fresh water will be injected or infiltrated to sweep the ore zone in the leached area. The solution pumped during these periods will be added to the process stream and any residual acid will be consumed by the production of copper in other areas. The copper will then be removed and processed in the solvent extraction/electrowinning (SX/EW) plants.

Throughout the closure process, Magma will maintain hydraulic control over all regions of the orebody that have been subjected to in-situ leaching. During active sweeping of the individual ore blocks, this control will be accomplished in the same manner as that utilized during leaching. This approach will use surrounding recovery wells as a means of sustaining an inward gradient around the region being closed. After sweeping and reduction of the concentrations of dissolved constituents, a series of secondary control wells will continue to function and serve to capture any affected groundwater within the confines of the proposed in-situ mine area. The effectiveness of both the primary and secondary control strategies has been demonstrated as part of the groundwater modeling simulations presented in Volume IV.

The advantages of the close-as-you-go process is that water is used in an economical manner, as water must be added to the system to compensate for salts bled to the Evaporation/Tailings Pond. The net result is that most of the orebody will have been rinsed of the majority of sulfate and other leachable ions during normal operation. The closure cost will be absorbed as part of the normal operating cost, and will be accrued and expensed at an estimated $0.035 per pound of copper produced, as described more fully in Appendix A.

Once the last set of wells on line begin closure, it is expected that closure of these wells will take less than 1 year. Again, the process solutions will ultimately be neutralized and reside in the Evaporation/Tailings Pond.

The rinse solution during the sweep operation will be analyzed for sulfate. When the sulfate level decreases to below a level of 750 parts per million (ppm), then the wells will be shut down and closed in accordance with the well closure plan. The ultimate goal is to flush to a level where, upon closure, no hazardous or non-hazardous constituents will exceed Arizona Water Quality Standards (AWQS) at the Point of Compliance (POC).

Magma believes that environmental impacts will be temporary and limited to the aquifer exemption area and only during the life of the mine. Residual waters remaining in the ore zone after closure will meet primary drinking water standards, and consequently there will be no long term or irreversible environmental impacts. The operation of the in-situ leaching mining operation will allow recovery of the copper resource that otherwise would have been lost.

2.8 EXEMPTION CHECKLIST

Table 2.8-1 (UIC) is submitted as an aid to the Environmental Protection Agency (EPA) in determining completeness. The left column is the regulatory guidelines while the right two columns indicate the reference location of the required information and any pertinent comments.

2.9 CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Bradford A. Mills, Executive Vice President
NAME AND OFFICIAL TITLE

B. A. Mills
SIGNATURE

1/16/96
DATE SIGNED

TABLES

Table 2.2-1 Property Owners Within 1 Mile of the In-situ Mine Area			
Company or Individual	**Address**	**Approximate Acres**	**Direction from the In-situ Mine Area**
Scott Riggins	P.O. Box 2150 Coolidge, AZ 85228	300	West
ASARCO, Inc.	Duane Yantorno 1150 N. 7th Avenue Tucson, AZ 85705	394	West
State of Arizona	Shirin Tolle 3033 North Central Avenue Phoenix, AZ 85012	182	Northeast

Table 2.2-2 Summary of Irrigation Groundwater Use Within 1 Mile of the In-Situ Mine Area				
ADWR Registration Number	**Well ID**	**Owner**	**1993 Water Use (Acre-Feet)**	**1994 Water Use (Acre-Feet)**
55-627614	D(4-9)27cad Supply Well 1	Magma Copper Company	0.00	0.00
55-627612	D(4-9)27cbd1 England No. 3	Magma Copper Company	210.67	519.90
55-627611	D(4-9)27ddd England No. 2	Magma Copper Company	66.03	416.07
55-627608	D(4-9)28cdb WW3, PW-3	Magma Copper Company	395.40	754.66
55-609666	D(4-9)29dab	Riggins Pinal	0.00	0.00
55-609667	D(4-9)29dac	Riggins Pinal	0.00	0.00
55-627610	D(4-9)29dca PW-20	Magma Copper Company	217.66	511.20
55-609672	D(4-9)32baa2	Riggins Pinal	471.50	859.34
55-609671	D(4-9)32bda	Riggins Pinal	0.00	0.00
55-609668	D(4-9)32cbd1	Riggins Pinal	517.96	730.60
55-609670	D(4-9)32cbd2	Riggins Pinal	379.36	593.13
55-609669	D(4-9)32dda	Riggins Pinal	0.00	0.00
55-627609	D(4-9)33aad PW-4	Magma Copper Company	0.00	0.00
Total Water Use			2,258.58	4,384.90

NA - Not applicable
Source: ADWR, 1995
See Appendix B for additional well information
See Sheet 1.2-2 for locations

Table 2.3-1. Summary of Information Concerning Existing Wells Within 5 Miles of the Florence In-Situ Mine Area

Well Number	Owner [a]	Date Completed	Depth Drilled (ft)	Casing Diameter (in)	Casing Depth (ft)	Perforated Interval (ft)	Reported Pumping Rate (gpm)[c]	Surface Elevation (ft, msl)[c]		Non-Pumping Water Level Measured Depth (ft)		Non-Pumping Water Level Date	Non-Pumping Water Level Altitude (ft, msl)	Logs[g]	Chemical Analyses[h]	Use[i]	Remarks[j]
(D-04-08) 1aaa	Nalbandian Farms	04- -40	472	20	472	178-460	699	1,528	---	149.3	---	6/11/41	1,378.70	D	---	Ir	55-610620
1baa	MAGMA	8-22-75	800	3	800	440-800	4	1,518.40	S	429	R	8/22/75	1,089.40	D	---	M	55-627625; UTL
1bca	U.S.Army Engineers	2-1-68	201	12	200	---	107	1,510	E	75	R	---	---	---	---	D	55-651042
2aaa1	Conkle	5-8-41	647	20	647	130-625	1,140	1,515	---	321	---	2/12/63	1,194.00	D	RP	U	55-610411; chkd; UTM; obstructed; loose cap
2aaa2		---	---	20	---	---	---	1,515	---	382.5	---	11/15/91	1,132.50	---	---	U	Chkd; UTM; obstructed; uncapped
2aaa3	Conkle	2-8-80	520	10	467	380-467	---	1,515	---	381.1	---	3/3/93	1,133.90	D	---	U	Chkd; uncapped
				8	440-520	467-520											
2aad	Zellweger	8-13-57	400	20	400	269-400	---	1,509	---	---	---	---	---	---	---	U	Also reported as 2add
2add	Conkle	5-10-05	600	20	600	---	---	1,508	E	425	R	---	---	D	---	---	55-610413
2baa	Conkle	9-20-52	338	20	338	208-322	---	1,520	---	Dry	---	12/1/82	---	D	---	D	55-610412; registered as 2abb
2ccc	Conkle	3-27-41	---	20	---	---	---	1,532	---	240.2	---	3/3/93	1,291.80	D	---	U	Chkd; uncapped
		4-30-05	485	---	485				---	---	---	---	---	---	---	---	---
12acc	Johnson	4-22-05	355	3	40	---	---	1,505	E	155	R	---	---	D	---	Ir	---
12ccd	Thompson	---	500	---	---	---	---	1,502	E	---	---	---	---	---	---	Ir	---
13ddc	Conoco	---	500	6	500	---	---	1,479	---	210.2	---	3/3/93	1,268.80	---	---	E	55-504706; chkd; capped
14baa	Hooper	4-12-05	200	10	200	---	35	1,525	E	135	R	---	---	---	---	D	55-602458
14caa	Wolfswinkle	06- -52	370	16	265	---	---	1,525	E	150	R	---	---	---	---	Ir	55-623857
14ddc	Vermeer	---	---	---	---	---	25	1,518	E	---	---	---	---	---	---	D	55-518644
23acb	Wolfswinkle	---	---	---	---	---	---	1,520	E	---	---	---	---	---	---	Ir	55-623861
23ccc	Wolfswinkle	---	---	---	---	---	---	1,500	E	---	---	---	---	---	---	Ir	55-623862
23dbb	Conoco	---	---	---	---	---	---	1,517	---	Dry	---	3/13/84	---	---	---	U	---
24add	Wolfswinkle	---	---	---	---	---	---	1,475	E	---	---	---	---	---	---	Ir	55-623863
35daa	Bean	6-28-57	323	16	323	160-318	450	1,422	---	117.8	---	11/1/88	1,304.20	D	---	Ir	55-621537
35dda	Bean	7-30-72	815	20	605	190-600	184	1,420	---	72.2	---	3/3/93	1,347.80	D	RP	Ir	55-621538; chkd; eqpd
36aad	Feliz	4-5-05	420	10	420	---	34	1,438	---	144.6	---	11/1/88	1,293.40	---	---	D	55-638448
36abd1	Feliz	6-2-05	80	---	---	---	---	1,445	E	---	---	---	---	D	---	O	---
36abd2	Felix	7-18-55	720	20	720	320-400	1,650	1,445	---	126.2	---	3/3/93	1,318.80	D	RP	Ir,S	55-616927; registered as 36aba; chkd eqpd
						440-720											
36bad	Felix	4-3-05	250	8	250	---	30	1,440	E	197	R	---	---	---	---	D	55-634418
36bcd	Bean	2-22-51	550	20	522	70-510	524	1,427	---	122.3	---	11/1/88	1,304.70	D	RP	Ir,D	55-621536
36dab1	Felix	4-3-05	250	8	250	---	30	1,430	E	197	R	---	---	---	---	D	55-634397
36dab2	Feliz	4-23-05	212	7	212	---	25	1,430	E	175	R	---	---	---	---	D	55-639694
36dab3	Feliz	04--52	150	6	150	---	8	1,430	E	125	R	---	---	---	---	D	55-638408
36dab4	Rameriz	---	200	6	200	---	8	1,430	E	125	R	---	---	---	---	D	55-638407
(D-04-09) 3aaa	Herseth Feedlots	08--42	504	20	504	220-500	1,933	1,600	---	361.3	---	1/3/69	1,238.70	---	RP	Ir,S,D	55-619404
3aad	Herseth Feedlots	1-30-75	838	16	838	470-825	---	1,597	---	410.5	---	3/3/93	1,186.50	D	RP	Ir,S,D	55-619401; registered as 3aba; chkd eqpd
3aba	Herseth Feedlots	5-10-05	504	20	504	400-504	650	1,591	---	372	---	12/20/71	1,219.00	---	---	Ir,S,D	55-619402; registered as 3aaa
4aaa	Baxter	03--51	433	20	433	200-431	1,200	1,575	---	396.9	---	11/15/91	1,178.10	D	---	Ir	55-625476
4aad	Brooks	4-24-05	580	20	580	---	4	1,575	E	450	R	---	---	D	---	Ir	---
4ada		---	---	---	---	---	---	1,571	---	---	---	---	---	---	---	U	---
4baa	Kirkland	1-20-51	434	20	434	200-420	943	1,564	---	254.1	---	3/3/93	1,309.90	D	---	U	Chkd; loose cap
4ddc	Baxter	2-4-77	---	20	750	250-750	1,500	1,560	---	364.5	---	11/8/84	1,195.50	---	RP	Ir	55-625475; registered as 4ddd
4ddd1	Baxter	3-15-73	690	20	690	330-620	1,500	1,564	---	341.7	---	3/3/93	1,222.30	D	RP	Ir	55-625477; chkd; eqpd
4ddd2	Brooks	5-30-05	750	20	750	---	1,300	1,564	E	351	R	---	---	D	---	Ir	---
5aab1	Jobe	04--41	403	20	403	200-390	1,776	1,555	---	388.2	---	11/15/91	1,166.80	D	---	U	Also reported as 5aaa
5aab2	Chapman	6-24-67	600	20	427	390-427	20	1,550	---	406.2	---	11/15/91	1,143.80	D	---	D	55-612176; registered as 5aaa
				16	420-600	420-600											
5aad	Jobe	5-15-05	640	---	---	---	1,500	1,551	---	---	---	---	---	D	---	U	---
5bab	Demetria	5-3-69	635	20	629	420-620	1,100	1,546	---	416.6	---	11/15/91	1,129.40	D	---	Ir	55-612173
(D-04-09) 5bbb	Demetria	7-1-73	800	20	571	450-571	1,100	1,540	---	445.6	---	11/7/84	1,094.40	D	---	Ir	55-612172
				16	546-780	580-780											
5cdb	Demetria	5-1-76	683	18	408	275-380	---	1,530	---	365	R	---	1,165.00	D	---	Ir	55-612170; registered as 5cca
				14	408-680												
5daa	Demetria	11-20-51	460	20	448	200-438	2,680	1,548	---	366.9	---	3/3/93	1,181.10	D	---	Ir,U	55-612174; chkd; loose cap
6aaa1	Clemans Bros. Cattle	5-14-40	463	20	463	200-450	1,020	1,541	---	173.9	---	1/31/47	1,367.10	D	---	U	---
6aaa2[No.4]	Nalbandian Farms	01--71	1,000	20	600	450-600	1,148	1,541	---	412.4	---	12/19/89	1,128.60	D,L	RP	Ir	55-610623
				16	600-1,000	600-1,000											
6aba[No.3]	Nalbandian Farms	5-9-46	466	20	466	190-460	1,598	1,536	---	172.6	---	8/30/46	1,363.40	---	RP	Ir	55-610622
		3-23-71	860	20	860	---	---	1,537	E	---	---	---	---	---	---	---	---
6ada[No.6]	Nalbandian Farms	07--73	1,529	20	1,000	350-1,000	641	1,537	---	398.6	---	12/19/89	1,138.40	D,L	RP	Ir	55-610632
				10	1,000-1,529	1,000-1,529											

Table 2.3-1. Summary of Information Concerning Existing Wells Within 5 Miles of the Florence In-Situ Mine Area

Well Number	Owner[a]	Date Completed	Depth Drilled (ft)	Casing Diameter (in)	Casing Depth (ft)	Perforated Interval (ft)	Reported Pumping Rate (gpm)[c]	Surface Elevation (ft, msl)[e]		Non-Pumping Water Level Measured Depth (ft)		Non-Pumping Water Level Date	Non-Pumping Water Level Altitude (ft, msl)	Logs[g]	Chemical Analyses[h]	Use[i]	Remarks[j]
6add[OB 4N]	MAGMA	9-5-75	800	3	800	440-800	4	1,535	---	414	R	9/5/75	1,121.00	D	---	M	55-627624; UTL
6baa1	Clemans Bros Cattle	4-18-57	592	20	590	290-585	1,870	1,534	---	258	R	---	1,276.00	D	RP	U	---
6baa2[No.5]	Nalbandian Farms	12--72	1,534	20	980	500-	1,025	1,537	---	411.2	---	12/19/89	1,125.80	D,L	RP	Ir	55-610624; also reported as 6caa
				12	980-1,534												
6bba[No.2]	Nalbandian Farms	12-5-74	942	20	798	500-780	1,836	1,532	---	420.5	---	11/18/91	1,110.50	D	RP	Ir	55-610621
7aaa1	B & W 308 Ltd	06--51	760	20	300	165-300	1,100	1,524	---	373.6	---	11/7/84	1,150.40	D	---	Ir,S,D	55-622013
				18	300-760	300-407											
7aaa2	Brittain	5-4-05	426	---	---	---	3,400	1,524	---	170	R	---	1,354.00	D	---	Ir	---
7aaa3	B & W 308 Ltd	3-23-73	862	20	634.	---	1,800	1,524	---	350	---	04--73	1,174.00	D	---	Ir	55-622014; registered as 7aad
				18	325-862	375-862											
7baa	Brittain	5-3-05	210	10	210	180-210	1,000	1,517	---	173.8	---	2/20/52	1,343.20	D	---	U	---
7dbb	Wolfswinkel	03--52	450	20	450	170-400	---	1,510	---	336.7	---	11/7/84	1,173.30	D	---	Ir	55-623858
8cba1[OB-3N]	MAGMA	5-15-75	600	3	520	360-520	---	1,522	---	306.4	---	3/9/93	1,215.60	D	---	M	55-627623; chkd; capped
8cba2	Palmer	---	400	20	400	---	---	1,522	E	---	---	---	---	---	---	---	55-634595
8dda		5-12-05	600	16	---	---	---	1,545	---	---	---	---	---	---	---	U	---
15bab1[SG-5]	USBR	12-9-77	613	6	613	16-613	---	1,565	---	---	---	---	---	G	---	Pz	UTL
15bab2[PZ-1]	USBR	12-9-77	613	1-1/4	499	491-499	---	1,565	---	332.9	---	4/21/78	1,232.10	---	RP	Pz	UTL
17acc	Conoco	1-1-53	680	20	680	---	---	1,529	---	---	---	---	---	---	---	---	---
17bbc	MAGMA	4-23-78	760	3	760	---	---	1,517	E	---	---	---	---	D	---	---	55-627652
17bcc	Conoco	2-9-52	450	32	432	190-432	1,131	1,514	---	204.6	---	1/3/77	1,309.40	D	RP	Ir	55-627615
17bdd1		11-20-51	504	20	435	---	---	1,527	E	---	---	---	---	---	---	---	Chkd; eqpd
17bdd2[OB-A]	MAGMA	12-2-75	461	6	456	296-456	---	1,523.90	S	289.2	---	3/9/93	1,234.70	D	---	M	55-627637; chkd; capped
17bdd3[OB-B]	MAGMA	12-12-75	480	6	475	295-475	---	1,526.10	S	292.1	---	3/9/93	1,234.00	D	---	M	55-627638; chkd; uncapped
18 1	Conoco	9-1-84	---	6	---	---	---	---	---	---	---	---	---	---	---	E	55-508802
18 2	Conoco	---	---	---	---	---	---	---	---	---	---	---	---	---	---	U	55-511898
18aad1	Smith	6-11-52	426	20	426	165-419	---	1,513	---	250.6	---	3/2/93	1,262.40	D	---	U	Also reported as 18ada; chkd; capped
18aad2	MAGMA	4-21-78	520	3	520	---	---	1,513	---	270.5	---	12/23/71	1,242.50	D	---	U	55-627651; destroyed
18acc1	Conoco	---	---	---	---	---	---	---	---	---	---	---	---	---	---	E	55-504704
18acc2	Conoco	---	---	---	---	---	---	---	---	---	---	---	---	---	---	E	55-503052
18acc3	Conoco	---	---	---	---	---	---	---	---	---	---	---	---	---	---	E	55-502875
18acc4	Conoco	---	---	---	---	---	---	---	---	---	---	---	---	---	---	E	55-502982
18bab	Conoco	---	---	---	---	---	---	---	---	---	---	---	---	---	---	E	55-504705
18ccc	MAGMA	8-11-77	803	5	803	0-803	---	1,482.50	S	Dry	---	11/7/84	---	D	---	U	55-627650
18ddd1	MAGMA	1-25-52	435	20	435	190-435	1,493	1,512	---	278	---	12/23/71	1,234.00	D	RP	Ir	55-627605; chkd; eqpd; UTM; no access
18ddd2	Conoco	6-3-05	250	8	---	---	---	---	---	---	---	---	---	---	---	E	55-500730
19aaa		---	---	---	---	---	---	1,510	---	242	---	1/31/63	1,268.00	---	RP	---	Destroyed
19ddd[LC]	MAGMA	10-10-73	400	8	267	---	---	1,501	---	225.9	---	3/3/93	1,275.10	---	---	M	55-627618; drilled by ASARCO; chkd; capped
20aba	Conoco	---	---	---	---	---	---	---	---	---	---	---	---	---	---	E	55-504702
(D-04-09)20adb[302]	MAGMA	4-19-78	1,060	3	1,060	---	---	1,522	E	---	---	---	---	D	---	---	55-627647; registered as 20aca; chkd; UTM; obstructed; uncapped
20bbb	Conoco	6-3-05	1,000	8	---	---	---	---	---	---	---	---	---	D	---	E	---
21bcd	MAGMA	8-4-77	465	6	465	---	---	1,534.80	S	278.4	---	---	1,256.40	D	---	E	55-627648
22 1	Conoco	9-1-84	---	6	---	---	---	---	---	---	---	---	---	---	---	E	55-508803
22 2	Conoco	---	---	---	---	---	---	---	---	---	---	---	---	---	---	E	55-511899
22bad	Conoco	---	---	---	---	---	---	---	---	---	---	---	---	---	---	E	55-502879
22dcc	Conoco	---	---	---	---	---	---	---	---	---	---	---	---	---	---	E	55-504701
22ddc	Conoco	---	---	---	---	---	---	---	---	---	---	---	---	---	---	E	55-502878
23 1	Conoco	9-1-84	---	6	---	---	---	---	---	---	---	---	---	---	---	E	55-508804
23 2	Conoco	---	---	---	---	---	---	---	---	---	---	---	---	---	---	E	55-511900
23cba	Conoco	---	---	---	---	---	---	---	---	---	---	---	---	---	---	E	55-504699
23ccd1	Conoco	---	---	---	---	---	---	---	---	---	---	---	---	---	---	E	55-504698
23ccd2	Conoco	---	---	---	---	---	---	---	---	---	---	---	---	---	---	E	55-502877
25ac	Pace	4-26-05	350	6	---	---	---	---	---	---	---	---	---	---	---	D	55-600588
25bcc		---	250	8	---	---	---	1,480	---	151	---	1/25/67	1,329.00	---	---	U	---
25bcd[No.2]	Florence Gardens	02--42	300	20	---	---	1,200	1,475	---	143.3	---	11/8/84	1,331.70	D	RP	PS,D	55-601432
25bdc1	Florence Gardens	4-23-05	350	16	350	---	1,400	1,482	E	200	R	---	---	---	---	PS	55-610433; recharge
25bdc2[No.1]	Florence Gardens	3-22-83	540	16	540	200-530	1,200	1,482	---	101.7	---	2/16/83	1,380.30	D	---	PS	55-504767; also registered as 55-504696-25bdd
25bdd	Florence Gardens	4-23-05	350	20	350	---	1,400	1,475	E	200	R	---	---	---	---	PS	55-610432; recharge
25cdd	Brooks Farms	6-15-49	250	20	250	80-240	805	1,480	---	54.3	---	3/4/93	1,425.70	D	---	Ir	55-618028; registered as 25cda; chkd; eqpd
25dcc1	Poston Butte Farms	12-31-40	180	8	180	---	---	1,478	---	139.2	---	11/1/88	1,338.80	---	---	Ir,S,D	55 806268
25dcc2	Poston Butte Farms	12-31-40	209	6	209	---	---	1,480	E	158	R	---	---	---	---	S,D	55 806269
26bda1	Conoco	7-29-77	40	7	20	---	---	1,491	---	---	---	---	---	D	---	M	55-627647; UTL

Table 2.3-1. Summary of Information Concerning Existing Wells Within 5 Miles of the Florence In-Situ Mine Area

Well Number	Owner[a]	Date Completed	Depth Drilled (ft)	Casing Diameter (in)	Casing Depth (ft)	Perforated Interval (ft)	Reported Pumping Rate (gpm)[c]	Surface Elevation (ft, msl)[e]		Non-Pumping Water Level Measured Depth (ft)		Non-Pumping Water Level Date	Non-Pumping Water Level Altitude (ft, msl)	Logs[g]	Chemical Analyses[h]	Use[i]	Remarks[j]
		4-12-78	90						---	---	---	---	---	---	---	---	---
		4-23-79	140	5	40				---	---	---	---	---	---	---	---	55-627653
26bda2	MAGMA	6-1-05	---	---	---	---	---	1,491	E	---	---	---	---	---	---	M	55-627642; UTL
26caa	Rankin	9-1-47	258	20	258	70-248	2,500	1,473	---	68	---	3/3/93	1,405.00	D	---	Ir	55 805235; chkd; eqpd
26ccb	SCIDD	5-18-34	212	20	212	68-198	---	1,477.20	S	145	R	4/21/61	1,332.20	D	---	Ir	Chkd; destroyed
		4-21-61	317	16	283	198-278			---	---	---	---	---	---	---	---	---
26ccd	England & Coker	4-3-61	410	20	410	210-400	---	1,465	E	---	---	---	---	D	---	Ir	Chkd; destroyed
26dad	Rankin	4-1-48	200	20	198	64-193	---	1,465	E	---	---	---	---	D	---	Ir	UTL
27bbd	MAGMA	8-15-77	765	6	765	---	---	1,510	E	252.8	---	8/15/77	---	D	---	M	55-627646; UTL
27cac	MAGMA	2-3-55	305	10	305	203-295	---	1,480	---	167.3	---	3/2/93	1,312.70	D	---	D	55-627613; registered as 27cab; chkd; eqpd
27cad	MAGMA	12-9-44	290	20	290	62-275	---	1,473	---	160	R	3/25/62	1,313.00	D	---	Ir	55-627614; chkd; eqpd; UTM; no access
		3-25-62	500	16	290-500	290-490	---	1,475	E	---	---	---	---	---	---	---	---
27cbd1	MAGMA	5-14-05	410	20	410	210-400	1,251	1,470	---	161.4	---	3/2/93	1,308.60	---	RP	Ir,U	55-627612; England No. 3
27cbd2	MAGMA	---	---	---	---	---	---	1,472	E	---	---	---	---	---	---	---	55-627656
27dba	MAGMA	5-29-92	220	4	180	---	---	1,485	E	188	R	5/29/92	---	D	---	M	55-535365
27ddd	MAGMA	2-21-50	270	20	270	70-255	1,267	1,464	---	87.5	---	3/2/93	1,376.50	D	RP	Ir	55-627611; England No. 2; chkd; eqpd
		3-14-62	600	16	265-600	265-590			---	---	---	---	---	---	---	---	---
28	Conoco	9-1-84	---	6	---	---	---	---	---	---	---	---	---	D	---	E	55-508805
28add[No.84]	MAGMA	---	340	3	---	---	---	1,483	---	150.9	---	3/2/93	1,332.10	---	---	E	Chkd; capped
28bdc[PW 2]	MAGMA	1-24-75	981	24	80	---	1,600	1,478	---	181.4	---	3/4/93	1,296.60	D	RP,C	I,U	55-627607; registered as 20cab; chkd;capped
				18	621	234-621											
				14	621-981	621-981											
28bdd	Conoco	8-30-85	---	---	23	---	---	---	---	---	---	---	---	---	---	E	55-512144
28caa[420-S]	Conoco	05--74	1,662	---	1,662	---	---	1,480	---	201.3	---	12/23/71	1,278.70	D,L	---	U	---
(D-04-09)28cac[DM B]	Conoco	08--74	700	5	611	---	17	1,477.30	S	244	---	10/7/74	1,233.30	---	---	T	55-806521; also reported as 28cad; UTL
				4	611-700	611-700											
28cad1[OW 2]	Conoco	10-29-72	1,600	13	51	---	---	1,471	---	163.5	---	3/2/93	1,307.50	D	---	M	Chkd; uncapped; plugged below 1,030'
				8	295												
				5	1,030	295 1,030											
28cad2[DM A]	Conoco	08--74	700	5	382	---	30	1,477.10	S	251	---	10/7/74	1,226.00	D	---	U	Also reported as 28dbd; UTL
28cad3[OB-6]	MAGMA	---	---	4	---	---	---	1,478	---	178	---	3/4/93	1,300.00	---	---	M	---
28cbc1	MAGMA	8-1-77	80	5	80	---	---	1,470	---	---	---	---	---	D	---	M	55-627645
		4-12-78	180	---	---	---	---	---	---	---	---	---	---	---	---	---	55-627644
		4-23-79	280	---	---	---	---	---	---	---	---	---	---	---	---	---	55-627654
		4-9-80	430	---	---	---	---	---	---	---	---	---	---	---	---	---	55-627643
28cbc2	Conoco	8-27-85	---	---	48	---	---	---	---	---	---	---	---	D	---	E	55-511901
28cbc3	Conoco	8-9-86	55	6	26	---	---	---	---	---	---	---	---	D	---	E	55-515041
28cbc4	Conoco	---	520	---	---	---	---	---	---	---	---	---	---	D	---	E	55-500731
28cbc5	Conoco	---	---	---	---	---	---	---	---	---	---	---	---	D	---	E	55-504703
28cbc6		---	---	---	---	---	---	---	---	---	---	---	---	D	---	E	55-502876
28cca1	McFarland	5-14-05	520	---	---	---	---	1,468	E	---	---	---	---	D	---	Ir	---
28cca2[BIA9]	SCIDD	4-26-34	254	20	254	80-242	1,632	1,472.00	S	172	---	1/1/93	1,296.00	D	RP	Ir	55-621948; chkd; eqpd
		4-28-65	500	16	495				---	---	---	---	---	---	---	---	---
28cca3		---	---	20	---	---	---	1,474	---	184.2	---	11/1/88	1,289.80	---	---	U	---
				3													
28cda1[OW-3]	Conoco	12-10-45	272	20	270	75-270	740	1,474	---	165	---	3/4/93	1,309.00	D	RP	Ir,U	55-627640; also reported as 28cdb; McFarland well #1; chkd; capped
		7-6-63	560	16	260-560	260-560			---	---	---	---	---	---	---	---	---
28cda2[BIA10B]	SCIDD	8-15-72	2,006	24	0-76	---	2,240	1,467	---	160.2	---	3/2/93	1,306.80	D	RP	Ir,I	55-621949; chkd; eqpd; backfilled and plugged below 369'
				20	0-1,000	200-909											
				13	909 1,909	909 1,909											
28cda3[OW-1]	Conoco	10-25-72	1,498	10	68	---	---	1,474	---	161.2	---	3/4/93	1,312.80	---	RP	M	55-627657; chkd; loose cap
				5	1,035	495-1,035											
28cdb1	McFarland	4-28-05	560	20	560	---	---	1,474	---	170	R	---	1,304.00	D	---	Ir,U	McFarland Well #2; chkd; capped
28cdb2[PW-3]	MAGMA	11-21-74	938	24	81	---	2,095	1,474	---	164.3	---	3/2/93	1,309.70	D	RP,C	Ir	55-627608; chkd, eqpd
				18	496	240-496											
				14	496-936	496-936											
28cdb3		11-21-74	---	3	---	---	---	1,474	---	---	---	---	---	---	---	U	---
28dad[BIA10]	SCIDD	4-16-34	259	20	259	107-247	---	1,472.30	S	213.5	---	2/24/75	1,254.50	D	---	Ir	---
28dba[DM-D]	Conoco	08--74	635	5	364	---	7	1,478.90	S	176.4	---	11/1/88	1,302.40	---	---	U	Also reported as 28dbd; UTL
28dbc1	MAGMA	7-6-74	706	42	700	---	---	1,475	---	173.4	---	3/2/93	1,301.60	---	---	T	Shaft No. 1; north pilot mine shaft; chkd; capped
28dbc2	MAGMA	9-2-74	730	72	715	---	---	1,474.50	S	172.5	---	3/2/93	1,302.00	---	---	T	Shaft No. 2; south pilot mine shaft; chkd; capped

Table 2.3-1. Summary of Information Concerning Existing Wells Within 5 Miles of the Florence In-Situ Mine Area

Well Number	Owner[a]	Date Completed	Depth Drilled (ft)	Casing Diameter (in)	Casing Depth (ft)	Perforated Interval (ft)	Reported Pumping Rate (gpm)[c]	Surface Elevation (ft, msl)[e]		Non-Pumping Water Level Measured Depth (ft)		Date	Altitude (ft, msl)	Logs[g]	Chemical Analyses[h]	Use[i]	Remarks[j]
28dbd1[DM-C]	Conoco	08--74	610	5	358	---	20	1,473.10	S	162.5	---	12/20/85	1,310.60	---	---	U	55-806520; also reported as 28dac; chkd; UTM; obstructed
28dbd2[PW-1]	Conoco	12-2-74	949	24	80	---	450	1,467	---	158.9	---	3/2/93	1,308.10	D	RP,C	U	chkd; capped
				18	540	243-539											
				14	540-939	540-938											
28dbd3[365 S]	MAGMA	---	1,299	3	---	---	---	1,478	---	168.6	---	3/2/93	1,309.40	---	---	---	chkd; loose cap
28ddb[DM E]	Conoco	08--74	700	5	392	---	60	1,465	---	213	R	10/7/74	1,252.00	---	---	T	UTL
29cbc	SCIDD	5-15-05	334	20	334	---	1,125	1,460	E	167	R	---	---	D	---	Ir	---
29ccb[BIA11]	SCIDD	5-9-34	290	20	290	64-277	805	1,457.80	S	151.5	---	3/2/93	1,306.30	D	---	Ir	55-621950; registered as 29cbc; chkd; eqpd
		2-9-62	334	16	334	160-330			---	---	---	---	---	---	---	---	---
29dab	Riggins Pinal	8-25-71	1,625	7	1,600	---	35	1,475	E	---	---	---	---	---	---	I	55-609666
29dac	Riggins Pinal	7-31-71	1,098	11	1,098	---	35	1,465	E	---	---	---	---	---	---	I	55-609667
29dcb[PW 20]	MAGMA	1-10-75	1,180	24	81	---	1,881	1,460	---	144.6	---	3/2/93	1,315.40	D	RP,C	Ir	55-627610; registered as 29dca; chkd; eqpd
				18	1,176	229 1,176											
(D-04-09)30add		---	---	3	---	---	---	1,482	---	212.9	---	11/1/88	1,269.10	---	---	U	UTL
30bcc	MAGMA	---	---	3	---	---	---	1,468	---	156.5	---	3/3/93	1,311.50	---	---	E	chkd; uncapped
30cca	Yeo	5-20-05	415	12	415	---	---	1,461	---	---	---	---	---	---	---	Ir,D	55-618023; registered as 30cc
30cdc	MAGMA	---	---	---	---	---	---	1,448	E	---	---	---	---	---	---	A	55-627655
30dad		---	---	3	---	---	---	1,463	---	177.8	---	11/1/88	1,285.20	---	---	U	---
30dcd		---	---	---	---	---	---	1,445	---	184.7	---	11/15/83	1,260.30	---	---	Ir	---
30dda[No.6]	Conoco	5-11-65	355	20	346	165-345	809	1,458	---	130	R	5/1/65	1,328.00	D	RP	Ir	55-627617; also reported as 30daa; chkd; UTM
31aba	McFarland	11-24-48	250	20	224	100-216	---	1,445	E	---	---	---	---	D	---	Ir	---
31baa1	Chandler	5-5-05	300	4	300	---	25	1,449	---	220	R	---	1,229.00	D	---	D	55-600580
31baa2	Riggins Pinal	5-20-68	620	16	620	350-620	668	1,448	---	156.1	---	3/9/93	1,291.90	D	RP	Ir,D	55-600577; chkd; eqpd
		12-20-74	850	12	620-820	620-820			---	---	---	---	---	---	---	---	---
31bba	Riggins Pinal	7-14-51	382	20	320	100-300	1,411	1,444	---	160.5	---	11/1/88	1,283.50	D	RP	Ir	55-600579; chkd; UTM; no access
		2-14-80	763	16	300-400	300-400			---	---	---	---	---	---	---	---	---
				14	400-703	400-703											
				10	703-763	703-763											
31ccd[OB-1W]	Conoco	12-9-75	360	3	360	200-360	---	1,429	---	73	---	3/9/93	1,356.00	D	---	M	55-627630; chkd; capped
31dca	Riggins Pinal	3-5-61	448	20	446	140-440	1,634	1,434	---	139	---	11/1/88	1,295.00	D	RP	Ir	55-600578; chkd; eqpd; UTM; no access
		1-18-72	890	16	429-889	450-865			---	---	---	---	---	---	---	---	---
32ada	MAGMA	5-1-05	---	20	265	100-265	1,400	1,453	---	155.1	---	11/2/84	1,297.90	---	---	U	McFarland Well No. 3; replaced 1975; UTL; destroyed; 55-627604
		5-14-05	473	16	265-473	265-473			---	---	---	---	---	---	---	---	---
32baa1	Espinoza	05--52	346	20	346	70-340	---	1,449	E	---	---	---	---	D	---	Ir	---
32baa2	Riggins Pinal	5-5-05	410	20	410	---	1,082	1,448	---	152.4	---	12/20/85	1,295.60	---	RP	Ir	55-609672
32bda	Riggins Pinal	1-26-47	193	20	193	50-193	1,270	1,443	---	83.5	---	3/9/93	1,359.50	D	RP	Ir	55-609671; chkd; eqpd
		11-6-51	397	16	190-368	200-352			---	---	---	---	---	---	---	---	---
32caa	Chandler & Chandler	4-7-05	100	20	100	---	2,531	1,438	E	36	R	---	---	D	---	O	---
32cbd1	Riggins Pinal	4-30-05	250	20	250	---	200	1,435	---	28	---	3/9/93	1,408.00	---	---	D,U	55-609668; registered as 32cac; chkd; eqpd
32cbd2	Riggins Pinal	12-18-53	450	20	442	100-430	1,107	1,435	---	29.4	---	3/9/93	1,405.60	D	RP	Ir	55-609670; registered as 32bca; also reported as 32caa; chkd; eqpd
32dda	Riggins Pinal	2-9-47	203	20	203	50-200	1,428	1,438	---	142	---	11/2/84	1,296.00	D	RP	Ir	55-609669
		12-13-57	583	16	---	197-512			---	---	---	---	---	---	---	---	---
33aad[PW-4]	MAGMA	12-15-74	997	24	80	---	741	1,456	---	124.8	---	3/3/93	1,331.20	D	RP,C	Ir,U	55-627609; Terry Bros. Farm Well #3; chkd; eqpd; no motor
				18	598	252-598											
				14	598-997	598-997											
34add	Robertson	5-2-05	550	---	---	---	---	1,458	E	---	---	---	---	D	---	Ir	---
34daa	Robertson	4-26-49	184	20	184	80-175	---	1,457	---	54	R	4/26/49	1,403.00	D	---	U	Also reported as 34add
34dda[OB-1E]	MAGMA	7-30-75	392	3	392	264-392	11	1,460	---	144.1	---	11/2/88	1,315.90	D	---	M	55-627619; UTL
35aaa	Giles	7-20-51	270	18	224	1-224	---	1,468	---	47.7	---	3/8/93	1,420.30	D	---	Ir,S	55-625921; registered as 35aab; chkd; eqpd
				14	224-254	224-254											
35c	Rankin	5-5-48	208	8	208	---	20	---	---	160	R	---	---	---	---	D	55-631674
35d	Taylor	2-20-05	25	8	25	---	---	---	---	---	---	---	---	---	---	S,D	55-643744
35dda	Smith	---	---	---	---	---	---	1,485	---	176	R	11--75	1,309.00	---	---	---	---
35ddc	Southwest Gas	10-31-91	230	---	---	---	---	1,485	E	---	---	---	---	D	---	U	55-533207
36cac1[No.3]	Florence Water	7-5-39	575	20	575	---	950	1,488	---	135.5	---	3/8/93	1,352.50	---	---	PS	55-619535; chkd; eqpd
36cac2[No.4]	Florence Water	4-30-05	375	16	375	335-370	850	1,487	---	173.5	---	11/3/88	1,313.50	D	---	PS	55-619533; chkd; eqpd
36d	Butte View	5-16-05	300	6	150	---	35	---	---	110	R	---	---	---	---	D,S,Ir	55-606117
(D-04-10)17cad1	Palmer	12-3-59	335	20	30	---	2,600	1,515	E	120	R	---	---	---	---	Ir	55-617189
17cad2	Palmer	---	400	6	400	---	30	1,515	E	180	R	---	---	---	---	D	55-638410
17cbd	Palmer	5-12-05	400	---	---	---	---	1,525	---	140.2	---	3/8/93	1,384.80	---	---	Ir	chkd; eqpd
(D-04-10)18dcd1[SG-23]	USBR	4-13-79	1,560	8	20	---	---	1,565	---	---	---	---	---	D,G	---	Pz	---

Table 2.3-1. Summary of Information Concerning Existing Wells Within 5 Miles of the Florence In-Situ Mine Area

Well Number	Owner[a]	Date Completed	Depth Drilled (ft)	Casing Diameter (in)	Casing Depth (ft)	Perforated Interval (ft)	Reported Pumping Rate (gpm)[c]	Surface Elevation (ft, msl)[e]		Non-Pumping Water Level Measured Depth (ft)		Date	Altitude (ft, msl)	Logs[g]	Chemical Analyses[h]	Use[i]	Remarks[j]
18dcd2[PZ-1]	USBR	4-13-79	1,560	1-1/4	1,258	1,250-1,258	---	1,565	---	225.7	---	1/24/84	1,339.30	---	---	Pz	---
18dcd3[PZ-2]	USBR	4-13-79	1,560	1-1/4	588	580-588	---	1,565	---	224.5	---	1/24/84	1,340.50	---	---	Pz	---
19dad[OB-3E]	MAGMA	7-17-75	355	3	355	195-355	9	1,491	---	122.9	---	10/31/88	1,368.10	D	---	M	55-627621; UTL
20ddd[OB-4E]	MAGMA	7-11-75	365	3	365	205-365	7	1,512	---	131.1	---	10/31/88	1,380.90	D	---	M	55-627622; UTL
29add1	Clark	---	---	---	---	---	---	1,529	---	---	---	---	---	---	---	U	---
29add2	L and M Farms	5-17-05	230	8	230	---	30	1,529	---	190	R	---	1,339.00	---	---	D	55-616519
29baa[BIA3B]	SCIDD	3-15-68	795	20	492	---	2,500	1,504	---	187	---	01--93	1,317.00	D	---	Ir	Also reported as 29cdd; chkd; eqpd
				16	495-730												
				14	725-795												
29bdd	ADC	7-23-51	410	20	---	---	1,441	1,509	---	109.8	---	3/8/93	1,399.20	D	RP	Ir,I	55-610141; also reported as 29adc; chkd; eqpd
29cda	Cansino	6-2-05	300	8	300	---	---	1,520	E	180	R	---	---	D	---	U	55 085529
29cdd	Padilla	5-4-05	265	8	265	---	34	1,525	E	230	R	---	---	---	---	D	55-638406
29dad[BIA2]	SCIDD	1-23-62	622	20	532	170-524	1,760	1,539.10	S	190	---	01--93	1,350.00	D	---	Ir	55-621940; also reported as 29daa; chkd;eqpd
				16	527-622	535-618											
29ddc1	L and M Farms	10-10-46	400	20	---	130-400	1,500	1,544	---	125	R	1/21/52	1,419.00	D	---	D,Ir	55-616515
29ddc2	Clark	---	330	---	---	---	1,900	1,544	---	192	---	10/31/88	1,352.00	D	---	Ir	---
30bdd	Poston Butte Farms	09--46	300	20	300	100-300	1,800	1,490	---	157.2	---	12/16/91	1,332.80	---	---	Ir	55-605530
30cbb[OB-2E]	MAGMA	7-22-75	370	3	370	210-370	---	1,481	---	164	R	7/22/75	1,317.00	D	---	M	55-627620; UTL
31 1	Zellweger	4-29-05	368	20	---	---	2,200	---	---	90	R	---	---	D	---	Ir	---
31 2	Potter	8-27-79	300	8	300	---	30	---	---	180	R	---	---	---	---	D	55-633750
31acc	Lewis	8-22-73	521	10	470	---	35	1,510	E	220	R	---	---	---	---	D	55-612520
31baa1[BIA5]	SCIDD	4-17-34	350	20	350	90-334	2,244	1,495.60	S	116	---	3/3/93	1,382.00	D	RP	Ir	55-621943; registered as 31abb; chkd; eqpd
31baa2	Lewis	7-18-73	521	10	491	---	---	1,480	---	---	---	---	---	D	---	D	---
31baa3[BIA5B]	SCIDD	4-15-77	700	20	278	---	1,367	1,498	---	---	---	---	---	D	---	Ir	---
				16	278-700	320-640											
31ccb	Jamka	---	---	---	---	---	---	1,535	E	---	---	---	---	---	---	D	55-639999
31cdd	Lewis	2-9-77	934	20	845	280-420	2,000	1,534	---	192.9	---	3/8/93	1,341.10	D	---	Ir	55-612516; chkd; eqpd
				18	830-930												
31daa[BIA4]	SCIDD	4-4-34	220	20	220	100-207	1,160	1,534.30	S	198.9	---	10/31/88	1,341.10	D	RP	Ir	chkd; eqpd; UTM
		07--47	370	10	370	213-262			---	---	---	---	---	---	---	---	---
31dad	ADC	---	400	20	---	---	1,125	1,541	---	227.5	---	9/13/89	1,313.50	---	RP	Ir,I	55-610135; Dairy Farm Well
32aad	Brooks Farms	---	---	---	---	1,500	---	---	---	---	---	---	---	---	---	Ir	55-618027
32b	Padilla	---	300	8	300	---	35	1,560	E	220	R	---	---	---	---	D	55-639919
32bad1[BIA3]	SCIDD	4-4-34	212	20	212	98-198	1,800	1,535.80	S	---	---	---	---	D	RP	Ir	55-621941; also reported as 29cdd
		7-16-47	392	16	392	207-384			---	---	---	---	---	---	---	---	---
32bad2	Bowling	5-4-05	354	20	---	---	2,000	1,535	E	125	R	---	---	D	---	Ir	---
32bcc	Lewis	9-1-60	810	20	810	185-798	---	1,535	---	165	R	---	1,370.00	D	---	Ir	55-612515
32cbb[BIA4B]	SCIDD	6-14-79	931	20	495	255-495	1,811	1,535	---	205	---	01--93	1,330.00	D	---	Ir	55-621942
			16	928	495-928												
(D 05 08) 1aac1		---	60	16	54	---	---	1,428	E	---	---	---	---	---	---	O	---
1aac2		---	---	16	---	---	---	1,428	---	69.1	---	11/24/53	1,358.90	---	---	U	Destroyed
1abc	LDS	5-9-05	400	6	---	---	---	1,425	---	---	---	---	---	D	---	---	55-627913; registered as 1ba
1bcb[BIA13]	SCIDD	4-17-05	230	20	230	---	800	1,415	E	68	---	01--93	---	---	---	Ir	55-621952; also reported as 1bbb
1cda	Krappenberger	07--51	360	20	230	55-194	---	1,419	---	88.3	---	11/2/88	1,330.70	D	---	U	---
1dca	LDS	5-18-61	525	20	484	200-472	---	1,422	---	117.9	---	11/2/88	1,304.10	D	---	Ir	55-608010
1dda	LDS	5-9-46	508	20	308	36-258	1,200	1,420	---	89.8	---	2/1/63	1,330.20	D	---	Ir	55-608009; registered as 1d
(D-05-08) 2aaa	SCIDD	05--34	230	20	---	30-56	2,377	1,419	---	50.4	---	3/3/93	1,368.60	D	RP	Ir	chkd; eqpd
					91-108												
					187-217												
2acd		4-29-05	295	20	---	90-	---	1,408	E	96	R	---	---	---	---	Ir	---
2cda	Kenworthy	5-3-05	286	---	---	---	1,600	1,405	E	---	---	---	---	D	---	Ir	---
2daa1	Swanson	4-7-05	204	20	204	---	---	1,417	---	100.1	---	11/2/88	1,316.90	---	RP	Ir	55-616763; registered by section number only
2daa2	Swanson	6-2-65	480	20	480	---	1,260	1,412	---	95.6	---	3/15/84	1,316.40	---	---	Ir	55-616764; registered by section number only
2dab[OB-2W]	MAGMA	5-23-75	223	3	223	140-223	3	1,410	---	176	R	---	1,234.00	D	---	M	55-627631; UTL
11bcd1	ASLD	06--30	150	48	50	25-50	1,000	1,404	---	75	R	---	1,329.00	D	---	Ir	---
				20	50-150	50-150											
11bcd2		---	---	5	---	---	---	1,405	---	68.7	---	10/29/84	1,336.30	---	---	U	---
11bcd3		---	80	48	---	---	---	1,408	E	17	R	---	---	D	---	Ir	---
11ccc	Faul	12-14-63	685	20	685	140-645	985	1,421	---	164.1	---	8/30/89	1,256.90	D	RP	Ir	55-612747; chkd; eqpd; UTM; no access
11cdd	Faul	7-14-52	650	20	650	85-635	551	1,428	---	60.9	---	3/3/93	1,367.10	D	RP	Ir	55-612748; chkd; eqpd
11daa		---	300	18	---	---	1,250	1,420	E	---	---	---	---	D	---	Ir	---

Table 2.3-1. Summary of Information Concerning Existing Wells Within 5 Miles of the Florence In-Situ Mine Area

Well Number	Owner[a]	Date Completed	Depth Drilled (ft)	Casing Diameter (in)	Casing Depth (ft)	Perforated Interval (ft)	Reported Pumping Rate (gpm)[c]	Surface Elevation (ft, msl)[f]		Non-Pumping Water Level Measured Depth (ft)		Non-Pumping Water Level Date	Non-Pumping Water Level Altitude (ft, msl)	Logs[g]	Chemical Analyses[h]	Use[i]	Remarks[j]
11dcd	Faul	1-8-58	715	20	698	125-686	1,339	1,432	---	116.5	---	12/19/89	1,315.50	D	RP	Ir	55-612749
11ddc1		4-18-05	200	16	45	---	---	1,432	---	---	---	---	---	---	RP	Ir	---
11ddc2	AFS Enterprises	---	---	---	---	---	50	1,431	---	---	---	---	---	---	RP	Ir	55-610523
12	Blue Circle Atlantic	7-3-01	---	12	540	---	180	---	---	120	R	---	---	---	---	I	55-622483
12aad	Blue Circle Atlantic	2-25-48	220	20	164	38-152	808	1,418	---	13	---	3/2/93	1,405.00	D	RP	Ir	55-606372; registered as 12ada; chkd; eqpd
12aba1	Blue Circle Atlantic	5-18-05	430	20	430	---	1,400	1,412	E	250	R	---	---	D	---	Ir	55-606374
12aba2	Gila River Tribe	---	---	---	---	---	778	1,412	---	102.9	---	2/16/83	1,309.10	---	RP	Ir	---
12abd	Gila Farm	2-24-65	430	20	430	100-424	---	1,412	---	---	---	---	---	D	---	U	Destroyed
12ada1		4-12-40	610	20	---	70-445	1,000	1,416	---	70	R	---	1,346.00	D	---	---	---
12ada2	Blue Circle Atlantic	5-1-05	500	16	500	---	800	1,416	---	250	R	---	1,166.00	D	---	Ir	55-606372
12ada3	Anderson	5-1-05	220	20	---	164-	1,000	1,416	---	38	R	---	---	D	---	Ir	---
12ccb1	Bundrick	1-28-82	465	8	465	210-228	13	1,432	---	122.2	---	11/2/88	1,309.80	D	---	D	55-501839
					260-280												
					399-465												
12ccb2	Bundrick	1-30-82	465	8	465	---	100	1,432	---	---	---	---	---	D	---	---	55-630364
12ccb3	Tabert	---	---	---	---	---	---	1,432	---	160	R	---	1,272.00	---	RP	D	---
12ccd1	Meijer	5-8-05	300	8	250	---	35	1,435	E	165	R	---	---	---	---	D	55-630362
12ccd2	Meijer	5-26-05	390	6	360	---	35	1,435	E	165	R	---	---	---	---	D	55-630365
12ccd3	Bundrick	5-27-05	365	6	365	---	---	1,435	E	235	R	---	---	D	---	D	---
12ccd4	Squaw Mtn. MHP	12-10-87	460	8	460	360-460	---	1,435	E	105	R	---	---	D	---	D	55-519619
12cda1	Hohokam Country Club	3-6-66	500	16	380	150-375	---	1,435	---	120	R	3/6/66	1,315.00	D	---	Ir	55-610674
				14	380-500	380-500											
12cda2	Moody	07--72	360	12	360	280-355	---	1,437	---	119.7	---	11/2/88	1,317.30	D	---	D	55-635855
12cdb	Lofgreen	7-30-71	400	12	330	200-326	---	1,434	---	135.4	---	11/2/88	1,298.60	D	---	D	---
12cdc1		---	---	---	---	---	---	1,438	---	132.5	---	10/31/84	1,305.50	---	---	D	---
12cdc2		---	---	---	---	---	---	1,438	---	127.5	---	11/2/88	1,310.50	---	---	D	---
12cdd1	Moody	---	350	8	350	---	---	1,445	E	170	R	---	---	---	---	D	55 800869
12cdd2	Menkin	9-10-92	380	8	380	320-360	---	1,445	E	110	R	9/10/92	---	D	---	D	55-534883
12d1	Hohokam Country Club	8-1-51	---	8	268	---	20	---	---	220	R	---	---	---	---	D	55-610675
12d2	Pratt	5-17-05	400	12	400	---	35	---	---	230	R	---	---	---	---	D	55-611468
12d3	Pratt	5-17-05	400	12	340	---	40	---	---	230	R	---	---	---	---	D	55-605784
(D-05-08) 12dad1	Blue Circle Atlantic	8-3-51	420	20	418	100-406	600	1,435	---	125.9	---	11/2/88	1,309.10	D	---	Ir	55-606373
12dad2	Pinal Mammoth Gypsum	---	---	---	---	---	---	1,440	---	126.7	---	11/2/88	1,313.30	---	---	I	---
12dcb1	Hohokam Country Club	04--52	500	12	500	---	500	1,440	E	236	R	---	---	D	---	Ir	55-610674
12dcb2	Hohokam Country Club	5-19-05	500	16	500	---	---	1,440	E	120	R	---	---	D	---	Ir	---
12dcd	Hohokam Country Club	1-9-01	---	---	---	---	---	1,451	---	128.4	---	10/31/84	1,322.60	---	---	D	55-610675
12ddd1	Elks Lodge	3-16-75	385	12	385	145-230	35	1,455	---	95.2	---	3/3/93	1,359.80	D	---	D	55 801684; chkd; eqpd
					260-280												
12ddd2	Maddock	5-14-88	452	6	452	352-452	26	1,455	E	220	R	5/14/88	---	D	---	D	55-520852
13	Payne	4-14-05	180	16	---	---	---	1,200	---	72	R	---	---	D	---	Ir	---
13aab1	Attaway Ranches	02--47	323	20	323	110-323	1,800	1,459	---	140.1	---	10/31/84	1,318.90	D	---	U	Also reported as 13aaa
13aab2	Mutual Farms, Inc.	5-31-05	520	18	520	---	1,100	1,459	---	144.8	---	10/31/84	1,314.20	---	RP	Ir,D	55-622015; registered as 13aaa
13bbd		---	292	16	---	---	---	1,445	---	---	---	---	---	---	RP	U	Destroyed
13bca	Riggs	7-5-51	418	20	416	107-400	600	1,450	---	122.6	---	10/31/88	1,327.40	D	---	Ir	55-601791
13cad[BIA20]	SCIDD	05--34	204	20	204	70-120	1,210	1,453	---	89	---	6/1/47	1,364.00	D	---	Ir, A	Destroyed
					153-184												
		06--47	340						---	---	---	---	---	---	---	---	---
13cdb[BIA20B]	SCIDD	7-23-75	630	20	396	110-383	1,200	1,455	---	101.8	---	3/2/93	1,353.20	D	---	Ir	55-621929; chkd; eqpd
				16	385-616	400-610											
		8-27-80	990	12	990				---	---	---	---	---	---	---	---	---
13daa	U.S. Indian Irr Serv	4-3-05	312	24	90	---	---	1,460	---	80	R	---	1,380.00	D	---	U	Destroyed
13ddd	Riggs	---	418	6	418	---	20	1,462	E	218	R	---	---	---	---	D	55-601793
14abb	Faul	4-24-05	200	8	200	---	---	1,430	E	170	R	---	---	---	---	---	55-612750
14cad1	U.S. Indian Irr Serv	4-17-05	216	20	216	---	2,107	1,445	---	52	R	05--34	1,393.00	D	---	U	Destroyed
14cad2	SCIDD	10--56	730	20	704	140-696	1,700	1,445	---	136.2	---	10/31/88	1,308.80	D	RP	Ir	55-621930
14cba[BIA21B]	SCIDD	1-23-79	913	20	550	155-183	---	1,439	---	103.1	---	3/2/93	1,335.90	D	---	Ir,U	chkd; eqpd
					210-546												
				16	550-800	555-796											
14cbc	Anderson	---	340	10	340	---	35	1,438	E	240	R	---	---	---	---	D	55-606375
14d	Skousen	4-26-05	---	---	---	---	---	---	---	---	---	---	---	---	---	D	55-631292
14dad		4-17-05	---	---	---	---	1,570	1,448	---	135.2	---	1/14/58	1,312.80	---	---	U	Destroyed

Table 2.3-1. Summary of Information Concerning Existing Wells Within 5 Miles of the Florence In-Situ Mine Area

Well Number	Owner[a]	Date Completed	Depth Drilled (ft)	Casing Diameter (in)	Casing Depth (ft)	Perforated Interval (ft)	Reported Pumping Rate (gpm)[c]	Surface Elevation (ft, msl)[e]		Non-Pumping Water Level Measured Depth (ft)		Date	Altitude (ft, msl)	Logs[g]	Chemical Analyses[h]	Use[i]	Remarks[j]
23add	Benedict Feeding	4-12-84	415	5	415	340-415	15	1,445	E	190	R	4/12/84	---	D	---	D	55-507613
23bdd		---	1,050	---	---	---	---	1,567	---	---	---	---	---	L	---	U	---
23cbb1	SCIDD	05--34	228	20	228	67-70	1,749	1,437	---	47	R	05--34	1,390.00	D	RP	---	---
					92-132												
					204-214												
23cbb2	SCIDD	9-7-54	800	20	800	130-785	---	1,437	---	139.3	---	1/11/74	1,297.70	D	---	---	---
23cbb3[BIA23B]	SCIDD	10-30-72	1,060	20	---	220-530	---	1,437	---	111.8	---	3/2/93	1,325.20	L	RP	Ir	55-621931; chkd; eqpd
				16		535-1,055											
23ddd	U.S. Indian Irr Serv	4-30-05	---	---	---	---	1,256	1,448	---	79	---	01--46	1,369.00	---	---	U	Destroyed
24b	Myers	---	230	---	---	---	---	---	---	---	---	---	---	---	---	D	55-800287
24bcc	Lillie	5-3-05	250	8	250	---	25	1,448	E	207	R	---	---	---	---	D	55-634184
24cda1	U.S. Indian Irr Serv	4-17-05	216	20	87	---	1,525	1,462	---	64	R	05--34	1,398.00	D	RP	U	Destroyed
24cda2[BIA19]	SCIDD	11-16-51	600	20	600	145-590	1,800	1,462	---	138.8	---	3/2/93	1,323.20	D	RP	Ir	55-621928; registered as 24cad; chkd; eqpd
(D 05 09) 1	Trejo Oil Co.	---	---	---	---	---	---	---	---	---	---	---	---	D	---	E	55-528940
1aad	ADC	---	---	---	---	---	---	1,520	E	---	---	---	---	D	---	M	55-531739
1acd	ADC	3-27-89	1,100	16	1,100	580 1,100	---	1,530	E	196	R	3/27/89	---	D	---	D	55-523133
1add1	ADC	2-15-54	450	20	432	---	2,500	1,535	E	240	R	---	---	---	---	Ir,PS,I	55-610137
1add2	ADC	12-21-62	453	20	451	200-440	2,000	1,535	---	232	---	11/10/75	1,303.00	D	---	Ir,PS,I	55-610139
1bbb	Trejo Oil Co.	---	---	---	---	---	---	---	---	---	---	---	---	---	---	E	55-521351
(D 05 09) 2abd	MAGMA	05--58	520	20	520	140-510	2,120	1,494	---	161	---	3/8/93	1,333.00	D	---	Ir,U	55-627616; chkd; poorly capped
2ada[No.5]	Florence Water	9-30-53	575	20	562	350-547	1,300	1,503	---	167.7	---	3/8/93	1,335.30	D	---	PS	55-619534; chkd; eqpd
2bdc	USDA	4-29-05	---	---	---	---	---	1,480	---	80.2	---	2/14/51	1,399.80	---	---	Ir	Destroyed
2caa	Florence Unified	4-16-05	260	10	254	---	---	1,500	E	228	R	---	---	D	---	Ir	55-801142
2ddd	Alston Campbell	10-11-01	---	---	---	---	---	1,520	E	---	---	---	---	---	---	Ir	---
3adc	USDA	4-29-05	---	---	---	---	3,000	1,470	E	---	---	---	---	D	---	Ir	---
3ccd	Neely & French	10-27-00	---	---	301	---	---	1,485	---	---	---	---	---	D	---	---	55-633910
3dab	HRS Farms	5-1-05	450	20	450	---	3,000	1,475	---	182.5	---	12/11/91	1,292.50	---	RP	Ir	55-603850
3dac		---	---	---	---	---	---	1,490	E	98	R	---	---	---	---	Ir	---
4bdd	Layton	5-31-57	600	20	598	290-590	1,441	1,446	---	110.1	---	3/2/93	1,335.90	D	RP	Ir	55-624355; registered as 4cdd; also reported as 4caa; chkd; eqpd
4cab		---	---	---	---	---	---	1,445	---	159.9	---	4/14/70	1,285.10	---	---	Ir	---
4cda	Layton	01--48	341	20	322	100-310	2,180	1,453	---	148.8	---	11/2/88	1,304.20	D	RP	Ir	55-624355
5cdc1		02--41	355	20	355	40-260	---	1,434	---	37.4	---	3/2/93	1,396.60	D	RP	U	chkd; capped
5cdc2	Layton	1-12-66	505	20	505	140-505	1,978	1,433	---	147.8	---	11/14/83	1,285.20	D	RP	Ir	55-624358; registered as 5ccd; chkd; UTM; no access
5cdd		4-24-05	320	20	---	---	---	1,435	E	---	---	---	---	D	---	Ir	---
5dbd	Layton	08--46	225	20	208	50-195	2,225	1,437	---	130.8	---	11/1/84	1,306.20	D	RP	Ir	55-624357
6aaa1	England	4-23-05	604	20	604	---	---	1,434	E	118	R	---	---	D	---	---	---
6aaa2	Gibson	4-18-80	405	8	400	---	20	1,434	---	140	R	---	1,294.00	---	---	D,S	55-600753; registered as 6acb
6aac		07--40	504	20	---	120-	1,600	1,425	---	148.4	---	2/15/83	1,276.60	D	---	Ir	---
6bad	Lamoreaux	5-3-05	450	20	450	---	1,131	1,428	---	101.2	---	11/1/88	1,326.80	---	RP	Ir	55-604492
7cac1	Myers	4-15-05	100	8	---	---	25	1,435	---	Dry	---	10/31/84	---	D	---	U	---
7cac2	England	10--54	314	12	314	50-314	700	1,435	---	131.7	---	11/2/88	1,303.30	D	---	Ir,D	55 801137
7cad1	Young	10-3-63	336	12	336	210-235	40	1,450	---	137.4	---	11/2/88	1,312.60	D	---	D	55-620629
					300-310												
7cad2	Riggins	6-5-78	230	6	230	---	---	1,450	E	100	R	---	---	---	---	D	55-638436
7dbb	Hearty	8-28-57	314	16	313	170-306	220	1,438	---	153.1	---	10/25/75	1,284.90	D	---	D	55-610534
7dbd	Wilkerson	4-27-87	352	6	352	252-352	---	1,450	E	140	R	4/27/87	---	D	---	D	55-516955
7ddb[OB 2S]	MAGMA	5-28-75	400	3	400	240-400	4	1,465	---	115.6	---	3/8/93	1,349.40	D	---	M	55-627627;chkd; capped
8aaa		3-28-05	---	12	---	---	---	1,440	---	---	---	---	---	---	RP	Ir	---
8aad1	Clemans Cattle Co.	3-28-05	200	12	200	---	1,470	1,442	---	Dry	---	11/1/84	---	---	RP	U	---
8aad2	Layton	10-25-51	621	20	220	70-200	1,540	1,442	---	135.5	---	11/2/88	1,306.50	D	RP	Ir	55-624360
				16	210-420	221-410											
8acc	Clemans Cattle Co.	5-27-05	403	5	403	---	---	1,470	E	234	R	---	---	D	---	D	---
8cdd		3-26-52	500	16	500	177-488	---	1,477	---	168.1	---	11/1/84	1,308.90	D	---	U	Also reported as 8dbb
8dbb	Deputy MD	05--74	410	8	400	---	11	1,473	---	142.7	---	3/3/93	1,330.30	---	---	D	55-635712; chkd; eqpd
8dbd1	Yeo	6-3-85	303	8	303	260-303	45	1,485	E	190	R	6/3/85	---	D	---	D,Ir	55-508251
8dbd2	Gammons	4-9-86	700	6	700	600-700	35	1,485	E	160	R	4/9/86	---	D	---	D	55-513663
8ddb	Boswell	5-6-05	500	16	500	---	---	1,485	E	108	R	---	---	D	---	I	---
8ddd		08--52	254	12	---	196-245	200	1,485	---	105	R	---	1,380.00	D	---	I	---
9aba1	Neely	4-29-05	460	20	460	---	250	1,462	E	128	R	---	---	D	---	Ir	---
9aba2	HRS Farms	3-11-57	500	20	496	120-480	2,000	1,462	---	159.4	---	11/2/88	1,302.60	D	RP	Ir	55-603851; registered as 9aaa; also reported as 9abb
9baa	Layton	3-28-81	714	20	707	320-690	2,940	1,455	---	189.6	---	11/2/88	1,265.40	D	RP	Ir	55-624359; registered as 9aaa

Table 2.3-1. Summary of Information Concerning Existing Wells Within 5 Miles of the Florence In-Situ Mine Area

Well Number	Owner [a]	Date Completed	Depth Drilled (ft)	Casing Diameter (in)	Casing Depth (ft)	Perforated Interval (ft)	Reported Pumping Rate (gpm) [c]	Surface Elevation (ft, msl) [e]		Non-Pumping Water Level Measured Depth (ft)		Non-Pumping Water Level Date	Non-Pumping Water Level Altitude (ft, msl)	Logs [g]	Chemical Analyses [h]	Use [i]	Remarks [j]
9bad	Layton	---	194	20	194	---	---	1,458	---	---	---	---	---	---	---	D,S	55-624361, registered as 9baa
9cbb[OB 15]	MAGMA	6-2-75	380	3	380	220-380	5	1,460	---	119.4	---	3/8/93	1,340.60	D	---	M	55-627626; chkd, uncapped
9dad	Urton	04--47	406	20	406	110-396	1,700	1,493	---	187.4	---	11/3/88	1,305.60	D	---	Ir	55-605133
10acd	Lewis McFarland	12-31-48	550	20	550	130-538	---	1,510	---	120	R	12/31/48	1,390.00	D	---	Ir	---
10bbb	Neely	2-19-82	700	5	700	640-700	35	1,485	---	245	R	2/19/82	1,240.00	D	---	D	55-501969
(D-05-09) 10cbc1		--	85	48	---	---	---	1,494	---	---	---	---	---	---	---	U	Destroyed
10cbc2	Lewis	---	320	18	---	---	453	1,494	---	187.1	---	11/3/88	1,306.90	---	---	Ir,D	55-608734
10cbc3	Hiscox	6-3-83	362	10	362	240-362	35	1,494	---	167.1	---	3/3/93	1,326.90	D	---	D,Ir	55-505335, replaced 55-608734-10cbc2, chkd, eqpd
10ccd	Gentry	5-7-90	310	6	280	220-280	---	1,498	E	160	R	5/7/90	---	D	---	D	55-527325
11bdb	McFarland	5-31-05	600	10	600	---	35	1,518	E	260	R	---	---	---	---	D	55-612199
11bdd1	McFarland	4-30-05	412	20	---	---	2,000	1,540	---	126	R	2/27/47	1,414.00	D	---	Ir	55-612196
11bdd2	McFarland	5-1-05	550	20	550	---	2,000	1,540	---	120	R	12/22/48	1,420.00	D	---	Ir	55-612197
11cad	McFarland	5-1-77	973	20	---	---	2,000	1,538	---	230.1	---	11/3/88	1,307.90	---	---	Ir	55-612193
11ccb1	McFarland	7-14-64	940	20	940	230-940	2,600	1,525	---	---	---	---	---	D	---	Ir	55-612198
11ccb2	McFarland	4-29-83	720	16	720	360-720	35	1,525	E	260	R	4/29/83	---	D	---	D	55-504806
11cdc[BIA80]	SCIDD	3-30-61	845	20	545	210-535	2,000	1,540	---	226	---	1/1/93	1,314.00	D	RP	Ir	55-621922, registered as 11cdb
				16	530-831	540-825											
12acd	Apel	6-3-05	500	6	500	---	18	1,558	---	255	R	---	1,303.00	D	---	D	55 087356; registered as 12acc
12bbb[BIA110]	SCIDD	04--47	316	20	---	150-304	---	1,535.60	S	167.7	---	1/16/57	1,362.30	D	---	Ir	---
12bbc[BIA110A]	SCIDD	1-17-80	695	20	448	---	2,000	1,529	---	215.2	---	3/3/93	1,313.80	D	---	Ir	55-621913, chkd, eqpd
				16	448-695												
12bcb[BIA110B]	SCIDD	3-17-67	535	20	481	120-468	2,000	1,538	---	244.9	---	11/9/84	1,293.10	D,L	---	Ir	55-621912
14bcc[BIA89]	SCIDD	12--56	805	20	---	200-780	1,800	1,537.30	S	217	---	3/3/93	1,321.00	D	---	Ir	55-621919; also reported as 14cbb, chkd, eqpd
14cac1[SG 8]	USBR	2-24-78	1,598	6	15	---	---	1,545	---	---	---	---	---	D,L,G	---	Pz	---
14cac2[PZ 1]	USBR	2-24-78	1,598	1-1/4	1,363	1,354 1,363	1,545	---	---	271.8	---	3/1/79	1,273.20	---	---	Pz	---
14cac3[PZ 2]	USBR	2-24-78	1,598	1-1/4	1,101	1,092 1,101	1,545	---	---	271.2	---	3/1/79	1,273.80	---	---	Pz	---
14cac4[PZ 3]	USBR	2-24-78	1,598	1-1/4	702	698- 702	---	1,545	---	276.4	---	3/1/79	1,268.60	---	---	Pz	---
14cbb	ASLD	12--56	805	20	---	200-780	2,250	1,530	---	241.2	---	12/16/91	1,288.80	---	RP	I	55 800875
14dad	U.S. Indian Irr Serv	4-29-05	---	---	---	---	1,571	1,530	E	79	R	---	---	D	---	Ir	---
15cac	Lewis	5-11-05	400	8	400	---	35	1,520	E	250	R	---	---	---	---	D	55-612519
15dbc[BIA79]	SCIDD	8-24-46	424	20	---	120-400	2,000	1,526.70	S	203.3	---	3/3/93	1,320.70	D	RP	Ir	55-621923; chkd, eqpd
16c	Kempton Dairy Inc.	2-29-36	480	8	480	---	30	---	---	285	R	---	---	---	---	S,D,I	55-633674
17aaa	Urton	5-7-05	300	8	300	---	15	1,486	---	265	R	---	1,221.00	---	---	D	55-605135
17cdc1[No.1]	Arizona Water Co.	4-13-05	345	10	---	---	---	1,475	---	---	---	---	---	---	---	D,PS,I	55-616686
17cdc2[No.2]	Arizona Water Co.	---	---	---	---	---	222	---	---	1,475	---	---	---	---	RP	PS	---
17daa	Cook	4-12-05	260	6	260	---	11	1,486	---	153.2	---	3/3/93	1,332.80	---	---	D,S	55-638612; chkd, eqpd
18abb	Adams	5-13-90	335	8	322	---	12	1,440	E	225	R	---	---	D	---	D	55-527020
18baa	Tanner Co.	08--52	254	12	254	196-245	300	1,450	---	223	R	---	1,227.00	D	---	I	55-605123
18bab	Tanner Co.	5-5-72	500	16	450	---	---	1,454	---	147.8	---	11/2/88	1,306.20	---	---	I	55-605124; registered as 18baa
18bbc1	Anderson Clayton Co	---	---	---	---	---	---	1,465	E	---	---	---	---	---	---	D,S	55-626794
18bbc2		---	---	---	---	---	---	1,465	---	162.2	---	10/31/88	1,302.80	---	---	I	---
18bda	Riggs	8-18-75	800	20	800	500-800	1,860	1,457	---	222.3	---	10/20/75	1,234.70	D	---	Ir	55-601790
18bdd1	Riggs	3-30-40	396	20	396	80-382	922	1,464	---	152.1	---	12/16/91	1,311.90	D	RP	Ir	55-601792
18bdd2	Riggs	1-3-78	950	20	620	490-620	1,800	1,464	---	180.1	---	12/16/91	1,283.90	D	---	Ir	55-601789
				16	620-950	620-950											
18dac1	ASLD	9-2-58	210	12	---	---	27	1,468	E	86	R	---	---	---	---	D,S	55-615370
18dac2	Webb	5-11-05	235	8	---	175-	20	1,468	E	120	R	---	---	D	---	D	---
19aab1	Ogle	5-19-05	300	6	300	---	20	1,475	E	---	---	---	---	---	---	D	55-638430
19aab2[BIA111]	SCIDD	05--47	412	20	---	110-399	1,600	1,475	---	134.5	---	3/3/93	1,340.50	D	RP	Ir	55-621945; chkd, eqpd
		10-24-75	800	16	800	196-795			---	---	---	---	---	---	---	---	---
19aab3	Southwest Gas	8-17-00	---	---	---	---	---	1,475	E	---	---	---	---	D	---	O	55-533218, cathodic protection
19abb	Martin	3-26-73	386	8	381	---	---	1,471	---	220	R	3/26/73	1,251.00	D	---	D	55-638426
19bb	Henry	4-26-77	400	12	400	---	35	---	---	270	R	---	---	---	---	D	55-629521
19cac	Graham	9-2-86	400	10	130	---	---	1,472	E	130	R	9/2/86	---	D	---	D	55-514208
				8	110-400	120-400											
(D-05-09)19cdd		---	---	---	---	---	---	1,396	---	---	---	---	---	---	---	U	Destroyed
19ddd1	USDA	1-4-40	300	20	300	94-285	1,800	1,490	---	129.5	---	11/1/88	1,360.50	D	RP	I	---
19ddd2	LDS	---	---	20	---	---	15	1,490	E	---	---	---	---	---	---	D	55-619762
20acb	Griffin	5-15-91	402	8	402	362-392	---	1,485	E	240	R	5/15/91	---	D	---	Ir,S	55-528330
20bdd	Mauldin	---	---	6	---	---	---	1,485	E	---	---	---	---	---	---	D,S	55-633548
20cac	Cunningham	1-15-65	560	12	554	290-542	60	1,495	---	225	---	---	1,270.00	D	RP	Ir,S,D	55 800831, registered as20c

magma.flo\uic.app\volume.1\2'3-1.XLS\1/16/96\rbb

Table 2.3-1. Summary of Information Concerning Existing Wells Within 5 Miles of the Florence In-Situ Mine Area

Well Number	Owner[a]	Date Completed	Depth Drilled (ft)	Casing Diameter (in)	Casing Depth (ft)	Perforated Interval (ft)	Reported Pumping Rate (gpm)[c]	Surface Elevation (ft, msl)[e]		Non-Pumping Water Level Measured Depth (ft)		Non-Pumping Water Level Date	Non-Pumping Water Level Altitude (ft, msl)	Logs[g]	Chemical Analyses[h]	Use[i]	Remarks[j]
20dad[BIA25]	SCIDD	4-21-05	300	20	300	---	1,600	1,504	---	176.1	---	3/2/93	1,327.90	D	---	Ir	55-621933; chkd; eqpd
		6-8-61	760	16	760				---	---	---	---	---	---	---	---	---
				14		175-755											
20dcc[BIA122B]	SCIDD	7-28-78	1,225	20	598	220-588	2,300	1,504	---	178.6	---	3/2/93	1,325.40	D	RP	Ir	55-621905; chkd; eqpd
				16	590-1,223	594 1,215											
21aaa1	Lewis	---	400	8	400	---	15	1,517	---	209.4	---	11/3/88	1,307.60	---	---	D	55-605136
21aaa2	Lewis	---	---	6	---	---	---	1,517	E	130	R	---	---	---	---	D,S,Ir	55 805870
21add	J & D Lewis Farms	6-15-51	510	20	473	225-473	2,000	1,527	---	245.2	---	11/13/84	1,281.80	D	RP	Ir	55-605134
21bba	Kempton	8-21-81	925	5	925	420-920	30	1,497	E	165	R	---	---	D	---	D	55-500587
21caa	Mosley	10--77	350	8	350	---	35	1,512	E	200	R	---	---	---	---	D	55-638446
21cdc	Yoakum	5-16-85	385	8	385	345-385	---	1,518	E	220	R	---	---	D	---	D	55-510303
21dbc[BIA74B]	SCIDD	1-7-77	1,175	20	---	250-530	2,000	1,520	---	200.2	---	3/2/93	1,319.80	D	RP	Ir	55-621927; registered as21dcb chkd; eqpd
				16		550 1,170											
22abb	Lewis	8-15-58	600	20	600	350-582	2,700	1,531	---	219.8	---	11/3/88	1,311.20	D	RP	Ir	55-612518
		12-13-77	1,132	18	585-785	585-785			---	---	---	---	---	---	---	---	---
				16	765-1,050	765 1,050											
				12	1,040-1,130	1,040 1,130											
22add1	England	2-4-48	580	20	580	170-568	2,000	1,552	E	168	R	---	---	D	---	Ir	Also reported as 22adc
22add2	England	6-9-05	1,000	---	---	---	---	1,552	E	---	---	---	---	---	---	Ir	---
22baa		12-22-36	348	20	348	124-335	2,800	1,531	---	113	---	11/18/46	1,418.00	D	---	U	Also reported as 22abb
22bab		---	---	---	---	---	---	1,528	---	251.4	---	4/14/70	1,276.60	---	---	Ir	---
22bbb1	MAGMA	6-4-75	440	3	440	281-440	5	1,520	---	209.7	---	11/3/88	1,310.30	D	---	M	55-627628
22bbb2	Southwest Gas	8-17-00	---	---	---	---	---	1,520	E	---	---	---	---	D	---	O	55-533188; cathodic protection
22cba[BIA112]	SCIDD	3-14-47	432	20	432	155-420	1,700	1,529	---	208	---	01--93	1,321.00	D	RP	Ir	55-621911; also reported as 22cbb; chkd; eqpd
		7-31-75	1,154	16	1,152	245-1,145			---	---	---	---	---	---	---	---	---
22daa	England Farms	2-4-48	580	20	580	170-568	2,000	1,554	---	248.1	---	11/4/88	1,305.90	D	---	Ir	55-618508; registered as22ddd
22ddd	England Farms	12-23-47	636	20	636	180-624	2,200	1,559	---	251.6	---	11/4/88	1,307.40	D	RP	Ir	55-618509
24ddd	Hilgeman	4-13-05	---	12	---	---	15	1,630	E	204	R	---	---	---	---	S,D	55-638760
(D-05-10) 6abc1[SG-3]	USBR	11-23-77	1,170	8	20	---	---	1,545	---	---	---	---	---	D,L,G	---	Pz	---
6abc2[PZ 2]	USBR	11-23-77	1,170	1-1/4	219	210-219	---	1,545	---	---	---	---	---	---	---	Pz	---
6abc3[PZ 1]	USBR	11-23-77	1,170	1-1/4	513	504-513	---	1,545	---	246.1	---	3/21/78	1,298.90	---	---	Pz	---
6bcc	ADC	10-15-47	416	20	---	150-408	1,713	1,540	---	213.5	---	3/8/93	1,326.50	D	RP	Ir,PS,I	55-610136; chkd; eqpd
6bdc1	ADC	4-26-88	1,100	5	1,100	580 1,080	---	1,540	E	204	R	4/26/88	---	D	---	M	55-520262
6bdc2	ADC	3-3-89	1,100	16	1,100	580 1,100	---	1,540	E	201	R	---	---	D	---	D	55-523132
7aaa	England	5-15-05	165	8	---	40	3	1,590	E	28	R	---	---	D	---	S	---
8aaa	Ryan	---	---	---	---	---	---	1,640	E	---	---	---	---	---	---	D	55-530542
8aad	Corbin	---	400	6	---	---	35	1,650	E	390	R	---	---	---	---	D,S	55-634980
8baa	Underwood	5-11-05	480	8	480	---	---	1,618	---	280	R	---	1,338.00	---	---	D	55 803767; registered as 8aac
8bab1	Underwood	5-6-05	350	6	350	---	35	1,612	E	---	---	---	---	---	---	D	55 800855
8bab2	Mayfield	03--75	492	8	---	---	35	1,612	---	302	R	---	1,310.00	---	---	D	55-630222
8bad	Corbet	---	---	6	---	---	---	1,625	---	---	---	---	---	---	---	D	---
8bba	Mayfield	2-17-89	460	6	340	---	14	1,605	E	300	R	2/17/89	---	D	---	D	55-523233
				5	320-460												
(D-05-10) 8bbb1	Mayfield	8-23-85	418	8	---	378-418	25	1,600	E	278	R	8/23/85	---	D	---	D	55-508658
8bbb2	Mayfield	1-5-92	500	6	500	360-500	---	1,600	E	300	R	1/5/92	---	D	---	D	55-533444
8bbb3	Underwood	2-12-92	500	5	500	---	---	1,600	E	300	R	---	---	D	---	D	55-533745
8bcb1	Mayfield	8-3-84	403	8	403	358-403	23	1,610	E	296	R	8/3/84	---	D	---	D	55-508659
8bcb2	Carrasco	2-9-87	420	6	420	300-420	7	1,610	E	305	R	2/9/87	---	D	---	D,Ir	55-514613
8bcc	Mayfield	7-11-84	409	8	409	364-409	23	1,610	E	296	R	7/11/84	---	D	---	D	55-508530
8bcd	Mayfield	7-25-84	405	8	405	360-405	23	1,620	E	296	R	7/25/84	---	D	---	D	55-508531
8dcc	Kimbrell	6-25-92	500	4	480	380-480	---	1,650	E	320	R	6/25/92	---	D	---	D	55-535322
8dda	Montgomery	---	---	---	---	---	---	1,670	E	---	---	---	---	D	---	D	55-516383
8ddc1	Contreras	5-27-05	510	8	510	---	---	1,668	E	350	R	---	---	D	---	D	---
8ddc2	Beeler	9-4-79	530	10	12	---	35	1,668	---	370	R	---	1,298.00	D	---	D	55-632587
				8	530												
8ddc3	Whitworth	10-21-91	508	4	490	370-490	19	1,668	E	300	R	10/21/91	---	D	---	D	55-533107
8ddd1	Contreras	5-24-01	8	110	---	---	13	1,675	---	345	R	---	---	---	---	D	55-646077
17	Showmake	---	535	6	535	---	10	---	---	350	R	---	---	---	---	D	55-631478
17aaa	Curtis	9-5-86	500	6	500	380-500	12	1,678	---	349.3	---	3/8/93	1,328.70	D	---	D	55-514512; chkd; eqpd
17aab	Stephens	2-13-74	507	8	500	400-500	10	1,672	---	340	R	---	1,332.00	D	---	D.Ir	55-629979
17aad	Kelm	---	---	---	---	---	---	1,678	---	469.7	---	10/15/84	1,208.30	---	---	D	chkd; eqpd; UTM; obstructed

Table 2.3-1. Summary of Information Concerning Existing Wells Within 5 Miles of the Florence In-Situ Mine Area

Well Number	Owner [a]	Date Completed	Depth Drilled (ft)	Casing Diameter (in)	Casing Depth (ft)	Perforated Interval (ft)	Reported Pumping Rate (gpm)[c]	Surface Elevation (ft, msl)[e]		Non-Pumping Water Level Measured Depth (ft)		Non-Pumping Water Level Date	Non-Pumping Water Level Altitude (ft, msl)	Logs[g]	Chemical Analyses[h]	Use[i]	Remarks[j]
17abc	Kelm	---	---	---	---	---	---	1,659	---	---	---	---	---	---	---	D	---
17acb1	Jaquette	4-3-82	500	6	490	340-490	7	1,660	---	343	R	4/3/82	1,317.00	D	---	D	55-502088
17acb2	Montgomery	---	480	6	450	---	35	1,660	---	350	R	---	1,310.00	---	---	D	55-632780
17acc	Montgomery	8-20-80	480	6	430	---	5	1,665	E	340	R	---	---	---	---	D	55-602376
17add	Kelm	3-6-82	500	6	490	340-490	11	1,685	E	355	R	3/6/82	---	D	---	D	55-500849
19bcc	Hassett	---	---	---	---	---	---	1,625	E	---	---	---	---	D	---	D	55-507127
19dab	Wood	5-2-86	520	6	520	420-520	10	1,660	E	357	R	5/2/86	---	D	---	D	55-513829

Source: Montgomery (1994)

a MAGMA = Magma Copper Company
USBR = United States Bureau of Reclamation
SCIDD = San Carlos Irrigation and Drainage District
ADC = Arizona Department of Corrections
LDS = Church of Jesus Christ of Latter Day Saints
ASLD = Arizona State Land Department
USDA = United States Department of Agriculture

b feet = feet below land surface

c gpm = gallons per minute

d Altitude of land surface
S = determined from survey data
E = estimated from topographic map
All other values obtained from USGS and ADWR files

e feet,msl = feet above mean sea level

f Depth in feet below land surface
R = reported

g Logs available
D = Driller
L = Lithologic
G = Geophysical

h Water chemistry analyses available
RP = Routine parameters
C = Common constituents

i Well use
Ir = irrigation
M = monitor
D = domestic
U = unused
E = mineral exploration borehole
O = other
S = stock
Pz = piezometer
PS = public supply
I = industrial
T = test
A = abandoned

j Remarks
UTL = unable to locate, March 1993
Chkd = field checked, March 1993
UTM = unable to measure, March 1993
Eqpd = equipped with pumping equipment
Note: Selected data included in this table also included in Table B-4

Well ID*	Well Correlation Tables[a]	Well Type	Location/ ADWR No.**	Location Coordinates (Northing Easting)	Land Elevation (feet)[b]	Reference Point Elevation (feet)[b]	Total Depth (feet)[c]	Casing Diameter	Screened Interval (feet)[c]	Screened Zone	Top of Bedrock (feet)[c]	Date Installed	Well Owner	Condition/Remarks
Supply Well 1 (Magma Supply)	B-5	Irrigation	D(4-9)27cad 55-627614	745868.98N 654275.22E	1473	NA	500	20";0-290 16";290-500	62-490	G	NA	3-25-62	Magma	No access. Supplies water to Magma facilities.
Supply Well 2 (Farm Supply)	C1, C2, B-5	Domestic	D(4-9)27cac 55-627613 aka: D(4-9)27cab	746414.26N 653019.03E	1480	NA	305	10"	203-295	G	NA	2-3-55	Magma	Supplies to local domestic water Pump: Tri-clad induction motor 230/460V, 1755 RPM, 20 HP, Model 5K6236XH4B, 3 phase, 60 cycles
D(4-9)27cbd	B3, C1, C2, B-5		D(4-9)27cbd 55-627656 aka: 27cbd2	745976.72N 652973.87E	1472									Unable to locate. Limited information available.
MF2 (MF-Y)	B1, B3, B-5	Irrigation	D(4-9)28cdb 55-627641 aka: D(4-9)28cdbc D(4-9)28cdb1	745425.00N 647830.00E	1474.20	1477.10	520	20"	NA	NA	NA	1961	NA	Discharge rate in 1971 was 1,225 gpm. 2.85-foot stickup of 5.7-inch steel casing.
MF3 (MF-X)	B3, B-5	Irrigation	D(4-9)32ada 55-627604	743140.00N 646505.00E	1453	NA	473	20";0-265 16";265-473	100-473	NA	NA	1961	Magma	Well is abandoned.
England 3	B3, B-5	Irrigation	D(4-9)27cbd 55-627612 aka: D(4-9)27cbd1 D(4-9)27cbdd	746050.00N 652800.00E	1470	NA	410	20";0-410	210-400	G	400	1961	Magma	20-inch casing from 0 to 410 feet. Production rate was 1,440 gpm in 1971.
PW-1 (Conoco 1, WW-1)	B1, B3, B-5	Industrial	D(4-9)28dbd 55-627606 aka: D(4-9)dbd2	746030.00N 650070.00E	1467.80	1467.80	949	18";0-540 14";540-937	243-947	G,O	340	12-2-74	Magma	18-inch steel surface casing from 0 to 538 feet. 14-inch steel casing from 0 to 949 feet. Production rate was 450 gpm in 1976.

Table 2.3-2. Summary of Information Concerning Existing Wells Within One-Half Mile of the Florence In-Situ Mine Area

[a]The following are other tables which correlate with wells listed in the table.
- C1, C2: Existing water quality data, Appendix C, Volume II
- B1, B2, B3: Water level data, Appendix B, Volume II
- B5, Well data included in Montgomery and Associates (1994)

[b]Feet above mean sea level (MSL)

[c]Feet below ground surface

* The well ID listed first identifies the well name most commonly used with respect to documentation and well recognition. Any other names found for a particular well are also listed as a reference.

** The correct well identification is based on location and is listed first followed by all other numbers referenced to that well as found in various reports and documents.

Table 2.3-2. Summary of Information Concerning Existing Wells Within One-Half Mile of the Florence In-Situ Mine Area

Well ID*	Well Correlation Tables[a]	Well Type	Location/ ADWR No.**	Location Coordinates (Northing Easting)	Land Elevation (feet)[b]	Reference Point Elevation (feet)[b]	Total Depth (feet)[c]	Casing Diameter	Screened Interval (feet)[c]	Screened Zone	Top of Bedrock (feet)[c]	Date Installed	Well Owner	Condition/Remarks
PW-2 (Conoco 2)	B1, C1, B-5	Industrial	D(4-9)28cab 55-627607 aka: D(4-9)28cabb D(4-9)28bdc	747070.00N 647940.00E	1483.17	1483.57	981	18";0-621 14";621-981	234-981	G,O	580	1-29-75	Magma	18-inch steel surface casing 0 to 621 feet. 14-inch steel casing from 0 to 981 feet. Production rate was 1,600 gpm in 1976.
PW-3 (Conoco 3, WW-3)	B1, C1, C2, B-5	Irrigation	D(4-9)28cdb 55-627608 aka: D(4-9)28cdbb D(4-9)28cdb2	745591.29N 647985.08E	1470	1470	938	18";0-496 14";496-936	240-933	G,O	372	11-21-74	Magma	18-inch surface casing from 0 to 496 feet. 14-inch casing from 496 to 933 feet. Production rate was 1,500 gpm in 1976. Previously Conoco 3.
PW-4 (Conoco 4, WW-4)	B1, B3, C1, B-5	Irrigation	D(4-9)33aad 55-627609 aka: D(4-9)33aada	743778.00N 651583.00E	1456.60	1456.60	997	18";0-598 14";598-997	252-997	G,O,S	375	12-15-74	Magma	18-inch steel casing from 0 to 598 feet. 14-inch casing from 0 to 997 feet. Production rate was 1,000 gallons per minute (gpm) in 1977. Previously Conoco 4.
PW-20 (Conoco 20)	C1, C2, B-5	Irrigation	D(4-9)29dca 55-627610 aka:D(4-9)29dcac	745370.00N 644620.00E	1460	NA	1180	18";0-1176	229-1,176	G,O	930	1975	Magma	18-inch surface casing from 0 to 1,176 feet. Production rate was 2,000 gpm in 1976. West of the in-situ mine area. Pump: 4 stage Worthington, 15H-277, 400 HP, 460 V, set at 600 feet.
OB-1 (OW-1, OBS-1, OB-1 Conoco)	B1, B3, C1, C2, B-5	Monitor	D(4-9)28cda aka: D(4-9)28cda3	745613.75N 648660.86E	1472.12	1472.12	1498	5";0-1,035	470-1,035	O	455	1972	Magma	10 5/8-inch steel surface casing from 0 to 68 feet. 8 5/8-inch blank steel casing from 0 to 47 feet. 5 1/2-inch steel casing perforated from 470 to 1,035 feet. Cement plug set at 1,035 feet.

[a]The following are other tables which correlate with wells listed in the table.

- C1, C2: Existing water quality data, Appendix C, Volume II
- B1, B2, B3: Water level data, Appendix B, Volume II
- B5, Well data included in Montgomery and Associates (1994)

[b]Feet above mean sea level (MSL)

[c]Feet below ground surface

* The well ID listed first identifies the well name most commonly used with respect to documentation and well recognition. Any other names found for a particular well are also listed as a reference.

** The correct well identification is based on location and is listed first followed by all other numbers referenced to that well as found in various reports and documents.

Table 2.3-2. Summary of Information Concerning Existing Wells Within One-Half Mile of the Florence In-Situ Mine Area														
Well ID*	Well Correlation Tables[a]	Well Type	Location/ ADWR No.**	Location Coordinates (Northing Easting)	Land Elevation (feet)[b]	Reference Point Elevation (feet)[b]	Total Depth (feet)[c]	Casing Diameter	Screened Interval (feet)[c]	Screened Zone	Top of Bedrock (feet)[c]	Date Installed	Well Owner	Condition/Remarks
OB-2 (OW-2, OB-2 Conoco)	B1, C1, C2, B-5	Monitor	D(4-9)28cad aka: D(4-9)28cad1	745947.97N 649003.90E	1473.47	1473.47	1600	8";0-295 5";295-1,030	285-1,030	S	368.5	1972	Magma	13 3/8-inch blank steel surface casing from 0 to 51 feet. 8 5/8-inch blank steel casing from 0 to 295 feet. 5 1/2-inch casing perforated from 285 to 1,030 feet. Cement plug set at 1,030 feet.
OB-3 (McFarland 1, OW-3,Mf H20, MFZ)	B3, C1, C2, B-5	Irrigation	D(4-9)28cda 55-627640 aka: D(4-9)28cda1 D(4-9)28cdab	745695.00N 648536.00E	NA	NA	560	20";0-260 16";260-560	75-560	G	NA	7-6-63	Magma	Unused
OB-4	B-5	Monitor	D(4-9)28ddb	745194.72N 650636.16E	NA	NA	350	3"	160-340	G	NA	NA	Magma	Unable to locate
OB-5	B-5	Monitor	D(4-9)28cda	745115.23N 649038.11E	NA	NA	350	3"	160-340	G	NA	NA	Magma	Unable to locate
OB-6	B1, B-5	Monitor	D(4-9)28cad	746472.00N 648486.00N	1470.52	1472.30		4"					Magma	Aquifer test conducted 2/7/94 to 2/14/94. Pumped from PW-1.
OB1-1	B-5	Monitor	D(4-9)28caa	746428.25N 648750.08E	1476.48	NA	760	4"	360-740	O	360	1994	Magma	Aquifer test conducted 2/7/94 to 2/14/94.
OB2-1	B-5	Monitor	D(4-9)28dbc aka: D(4-9)28dbd	746157.89N 649563.89E	1471.56	NA	640	4"	400-620	O	340	1994	Magma	Aquifer test conducted 3/8/94 to 3/21/94.
OB2-2	B-5	Monitor	D(4-9)28dcb	745500.7N 649879.13E	1464.02	NA	800	4"	460-760	O	360	1994	Magma	Pump test conducted 4/20/94 to 5/2/94.
OB3-1	B-5	Monitor	D(4-9)28cbb	746204.02N 647890.16E	1475.78	NA	800	4"	500-780	O	430	1994	Magma	Aquifer test conducted 3/24/94 to 3/31/94.
OB4-1	B-5	Monitor	D(4-9)28cca	745584.31N 647783.01E	1471.70	NA	800	4"	440-780	O	380	1994	Magma	Aquifer test conducted 5/19/94 to 5/31/94.

[a]The following are other tables which correlate with wells listed in the table.

- C1, C2: Existing water quality data, Appendix C, Volume II
- B1, B2, B3: Water level data, Appendix B, Volume II
- B5, Well data included in Montgomery and Associates (1994)

[b]Feet above mean sea level (MSL)

[c]Feet below ground surface

* The well ID listed first identifies the well name most commonly used with respect to documentation and well recognition. Any other names found for a particular well are also listed as a reference.

** The correct well identification is based on location and is listed first followed by all other numbers referenced to that well as found in various reports and documents.

Table 2.3-2. Summary of Information Concerning Existing Wells Within One-Half Mile of the Florence In-Situ Mine Area															
Well ID*	Well Correlation Tables[a]	Well Type	Location/ ADWR No.**	Location Coordinates (Northing Easting)	Land Elevation (feet)[b]	Reference Point Elevation (feet)[b]	Total Depth (feet)[c]	Casing Diameter	Screened Interval (feet)[c]	Screened Zone	Top of Bedrock (feet)[c]	Date Installed	Well Owner	Condition/Remarks
OB7-1	B-5	Monitor	D(4-9)28cda	745455.55N 648872.17E	1468.27	NA	900	4"	540-880	O	370	1994	Magma	
PW1-1	B1, B-5	Test	D(4-9)28caa	746476.50N 648742.16E	1477	1477	760	6"	360-740	O	360	1994	Magma	Aquifer test conducted 2/7/94 to 2/14/94.
PW2-1	B1, B-5	Test	D(4-9)28dbc aka: D(4-9)28dbd	746199.14N 649536.12E	1471	1471.90	640	6"	400-620	O	340	1994	Magma	Aquifer test conducted 3/8/94 to 3/21/94.
PW2-2	B1, B-5	Test	D(4-9)28dcb	745543.15N 649854.34E	1464.30	1465.20	800	6"	460-760	O	360	1994	Magma	Pump test conducted 4/20/94 to 5/2/94.
PW3-1	B1, B-5	Test	D(4-9)28cbb	746250.70N 647873.55E	1475.50	1476.40	800	6"	500-780	O	430	1994	Magma	Aquifer test conducted 3/24/94 to 3/31/94.
PW4-1	B1, B-5	Test	D(4-9)28cca	745530.80N 647769.65E	1471.80	1472.15	800	6"	440-780	O	380	1994	Magma	Aquifer test conducted 5/19/94 to 5/31/94.
PW7-1	B1, B-5	Test	D(4-9)28cda	745467.86N 648823.52E	1468.60	1468.60	900	6"	540-880	O	370	1994	Magma	
Airshaft (North Shaft)	B-5	Test	D(4-9)28dbc aka: D(4-9)28dbc1	746460.43N 649349.76E	1476	NA	706	42";0-700	NA	NA	NA	1974	Magma	
Shaft No. 1 (South Shaft)	B-5	Test	D(4-9)28dbc aka: D(4-9)28dbc2	746374.85N 649349.49E	1476	NA	730	72";0-715	NA	NA	NA	1974	Magma	
84	B1, B-5	Explorati on Borehole	D(4-9)28add	747250.00N 651188.00E	1480.5	NA	340	3"	NA	NA	NA	NA	Magma	Well has been plugged off.

[a]The following are other tables which correlate with wells listed in the table.

- C1, C2: Existing water quality data, Appendix C, Volume II
- B1, B2, B3: Water level data, Appendix B, Volume II
- B5, Well data included in Montgomery and Associates (1994)

[b]Feet above mean sea level (MSL)

[c]Feet below ground surface

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Table 2.3-2. **Summary of Information Concerning Existing Wells Within One-Half Mile of the Florence In-Situ Mine Area**

Well ID*	Well Correlation Tables[a]	Well Type	Location/ ADWR No.**	Location Coordinates (Northing Easting)	Land Elevation (feet)[b]	Reference Point Elevation (feet)[b]	Total Depth (feet)[c]	Casing Diameter	Screened Interval (feet)[c]	Screened Zone	Top of Bedrock (feet)[c]	Date Installed	Well Owner	Condition/Remarks
BIA 9	B1, B3, C1, C2, B-5	Irrigation	D(4-9)28cca 55-621948 aka: D(4-9)28cca2 D(4-9)28cdb	745732.41N 647305.26E	1472.50	1472.50	500	20";0-254 16";254-495	80-495	G,O	NA	NA	SCIDD	Top oil drip. Sounding tube. Flow meter removed.
BIA 10B	B3, C1, C2, B-5	Irrigation	D(4-9)28cda 55-621949 aka: D(4-9)28cda2	745638.16N 649114.65E	1468.60	1468.60	2006	20";0-909 13";909-1,909	200-1,909	G,O,S	345	8-15-72	SCIDD	Sounding tube. Drip oil. Flow meter. Plug in side of discharge pipe.
BIA-10	B-5	Irrigation	D(4-9)28dad aka: D(4-9)27cac	746222.00N 651764.00E	1472.3	NA	259	20";0-259	107-247	NA	NA	4-16-34	NA	Concrete slab with 3-inch steel pipe protruding up with no access.
DM-A	B3, C1, C2,	Test	D(4-9)28cad aka: D(4-9)28cad2	746381.80N 649148.51E	1477.05	1478.70	700	5";0-382	NA	NA	350	NA	Magma	Unable to locate.
DM-B	C1, C2, B-5	Test	D(4-9)28cac 55-806521	746381.71N 648246.90E	1477.30	1478.11	700	5";0-611 4";611-700	NA	NA	574	NA	Magma	Unable to locate.
DM-C	B1, B3, C1, C2, B-5	Test	D(4-9)28dbd 55-806520 aka: D(4-9)28dbd1	746384.92N 650185.43E	1471.49	1473.10	610	5";0-358	NA	NA	335	1974	Magma	
DM-D	B3, C1, C2, B-5	Test	D(4-9)28dba aka: D(4-9)28dbd	746842.25N 649740.28E	1478.85	1480.10	635	5";0-364	NA	NA	350	NA	Magma	Unable to locate.
DM-E	B3, C1, C2, B-5	Test	D(4-9)28ddb	745516.10N 650741.49E	1465.0	1464.94	700	5";0-392	NA	NA	342	NA	Magma	Unable to locate.
D(4-9)27bbd	B-5	Recharge	D(4-9)27bbd 55-627646	NA	NA	NA	765	6";0-765	NA	NA	NA	8-15-77	Magma	Unable to locate.

[a]The following are other tables which correlate with wells listed in the table.

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- B1, B2, B3: Water level data, Appendix B, Volume II
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D(4-9)27dbb		Unknown	unknown.	746486.00N 654444.00E	NA	NA	NA	6"	NA	NA	NA	NA	unknown	1-foot steel casing stickup. Well cap is locked.
D(4-9)28cbc	B-5	Monitor	D(4-9)28cbc	746208.00N 646722.00E	NA	NA	NA	5"	NA	NA	NA	NA	Magma	.9-foot casing stickup. Steel plate tack welded over casing.
D(4-9)29dab	B-5	Industrial	D(4-9)29dab 55-609666		1,475.0	NA	1,625	7";0-1,600	NA	NA	NA	8-25-71	Magma	1.2-foot casing stickup.
D(4-9)29dac	B-5	Industrial	D(4-9)29dac 55-609667		1,465.0	NA	1,098	11";0-1,098	NA	NA	NA	7-31-71	Magma	Unable to locate.
M1-GL	B1	Monitor	D(4-9)33bac 55-547617	743799.85N 648550.02E	1461.1	1462.4	420	5";0-365	315-355	G	NA	6-17-95	Magma	1.5-foot LCS casing stickup. Installed Pump at 280 feet: Grundfos Model 10S-10-15, 1.0 HP, 460V
M2-GU	B1	Monitor	D(4-9)33bbc 55-547814	743737.92N 651658.43E	1459	1460.8	270	5";0-258	198-238	G	NA	5-25-95	Magma	1.5-foot LCS casing stickup. Installed pump at 180 feet: Grundfos Model 10S-10-15, 1.0 HP, 460V
M3-GL	B1	Monitor	D(4-9)33bbc 55-547614	743685.56N 651636.79E	1458.8	1460.74	370	5";0-358.5	298-338	G	NA	5-23-95	Magma	1.5-foot LCS casing stickup. Installed pump at 200 feet; Grundfos Model 10S-10-15, 1.0 HP, 460V
M4-O	B1	Monitor	D(4-9)33bbc 55-547615	743717.36N 651635.22E	1458.9	1460.6	510	5";0-485	405-465	O	370	5-21-95	Magma	1.5-foot LCS casing stickup. Installed pump at 380 feet; Grundfos Model 10S-15-21, 1.5 HP, 460V.
M5-S	B1	Monitor	D(4-9)33bbc 55-547616	743719.46N 651685.49E	1459.1	1460.47	613	5";0-516 4";516-597	516-576	S	370	5-18-95	Magma	1.5-foot LCS casing stickup. Installed pump at 500 feet; Grundfos Model 25S-20-26, 2.0 HP, 460V.

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M6-GU	B1	Monitor	D(4-9)28bcc 55-547815	747556.46N 647256.92E	1480.5	1481.72	590	5";0-583	524-564	G	NA	3-31-95	Magma	1.5-foot PVC casing stickup. Installed pump at 500 feet; Grundfos Model 10S-20-27, 2.0 HP, 460V.
M7-GL	B1	Monitor	D(4-9)28bcc 55-547611	747531.69N 647282.21E	1480	1480.95	940	5";0-592 4";592-928	859-919	G	NA	4-6-95	Magma	1.0-foot LCS casing stickup. Installed pump at 580 feet; Grundfos Model 10S-50-58DS, 5.0 HP, 460V.
M8-O	B1	Monitor	D(4-9)28bcc 55-547612	747523.83N 647230.35E	1479.1	1480.46	1115	5";0-591 4";591-1091	1,011-1,071	O	940	4-12-95	Magma	Installed pump at 580 feet; Grundfos Model 7S-15-26, 1.5 HP, 460V.
M9-S	B1	Monitor	D(4-9)28bcc 55-547613	747555.92N 647207.61E	1479.5	1481.18	1578	5";0-502 4";502-1570	1,510-1,570	S	930	3-23-95	Magma	Installed pump at 1377 feet; Grundfos Model 10S-50-48DS, 5.0 HP, 460V.
M10-GU	B1	Monitor	D(4-9)28dcb 55-547816	745467.53N 649798.29E	1464.3	1465.77	290	5";0-268	218-258	G	NA	5-10-95	Magma	Installed pump at 200 feet; Grundfos Model 10S-10-15, 1.5 HP, 460V.
M11-GL	B1	Monitor	D(4-9)28dcb 55-547817	745471.70N 649749.77E	1464.6	1466.01	370	5";0-350	290-330	G	NA	5-9-95	Magma	1.5-foot LCS casing stickup. Installed pump at 260 feet; Grundfos Model 10S-10-15, 1.0 HP, 460V.
M12-O	B1	Monitor	D(4-9)28dcb 55-547818	745506.14N 649798.24E	1464.3	1465.56	510	5";0-501	420-480	O	350	5-6-95	Magma	1.5-foot LCS casing stickup. Installed pump at 260 feet; Grundfos Model 10S-15-21, 1.5 HP, 460V.
M13-S	B1	Monitor	D(4-9)28dcb 55-547819	745507.59N 649748.96E	1464.3	1465.86	943	5";0-931	851-911	S	360	4-25-95	Magma	1.8-foot LCS casing stickup. Installed pump at 840 feet; Grundfos Model 16S-50-38, 5.0 HP, 460V.

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M14-GL	B1	Monitor	D(4-9)28cbc 55-549172	746414.71N 646961.20E	1472.8	1474.58	950	5";0-859	778-838	G	NA	6-2-95	Magma	1.5-foot LCS casing stickup. Installed pump at 260 feet; Grundfos Model 10S-10-15, 1.0 HP, 460V.
M15-GU	B1	Monitor	D(4-9)28cbc 55-547813	746418.02N 646908.14E	1472.6	1474.01	630	5";0-615	554-594	G	NA	6-6-95	Magma	1.5-foot LCS casing stickup. Installed pump at 260 feet; Grundfos Model 10S-10-15, 1.0 HP, 460V.
M16-GU	B1	Monitor	D(4-9)28acc 55-549140	745025.42N 647017.35E	1464.3	1466.05	690	5";0-678	598-658	G	NA	6-22-95	Magma	1.5-foot LCS casing stickup. Installed pump at 260 feet; Grundfos Model 5S-10-22, 1.0 HP, 460V.
M17-GL	B1	Monitor	D(4-9)28acc 55-549141	744976.80N 647017.02E	1464.4	1466.16	1130	5";0-1,018.5	938-998	G	NA	6-18-95	Magma	2.5-foot LCS casing stickup. Installed pump at 340 feet; Grundfos Model 10S-15-21, 1.5 HP, 460V.
M18-GU	B1	Monitor	D(4-9)33bac 55-547809	743800.82N 648501.52E	1461	1461.75	240	5";0-228	178-218	G	NA	6-18-95	Magma	1.5-foot LCS casing stickup. Installed pump at 170 feet; Grundfos Model 10S-10-15, 1.0 HP, 460V.
O3-GL	B1	Monitor	D(4-9)28cda 55-549153	745444.25N 648922.36E	1468.1	1469.35	395	5";0-385	325-365	G	NA	5-11-95	Magma	1.6-foot LCS casing stickup. Aquifer test performed 6/95, 8/95, 9/95.
O5.1-O	B1	Monitor	D(4-9)28dcc 55-549144	744718.01N 649599.80E	1462.2	1463.44	880	5";0-494 4";494-853	674-832	O	360	5-25-95	Magma	1.5-foot LCS casing stickup.
O5.2-O	B1	Monitor	D(4-9)28dcc 55-549145	744701.23N 649524.74E	1462.2	1463.47	880	4";0-792	712-771	O	380	5-20-95	Magma	1.5-foot LCS casing stickup.

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P5-O	B1	Test	D(4-9)28dcc 55-549147	744696.96N 649499.22E	1462.4	1463.8	800	6";0-790	414-454 473-513 533-572 592-632 671-691 711-730 750-770	O	375	5-22-95	Magma	1.5-foot PVC casing stickup.
O8-O	B1	Monitor	D(4-9)28dbb 55-549164	74690312N 649393.299E	1479.5	1481.3	610	4";0-599.5	401.5-579	O	353	8-26-95	Magma	1.5-foot LCS casing stickup. Aquifer test performed 9/95.
O8-GU	B1	Monitor	D(4-9)28dbb 55-549165	746792.74N 649386.23E	1478.0	1479.8	270	4";0-261	133-251	G	NA	8-16-95	Magma	1.5-foot LCS casing stickup. Aquifer test performed 9/95.
P8.1-O	B1	Test	D(4-9)28dbb 55-549166	746793.36N 649403.82E	1478.0	1478.8	616	6";0-600	399.5-580	O	353	8-14-95	Magma	1.5-foot LCS casing stickup. Aquifer test performed 9/95.
P8.2-O	B1	Test	D(4-9)28dbb 55-549166	746863.66N 649289.85E	1478.2	1479.7	610	6";0-596.5	396-576	O	360	8-23-95	Magma	1.5-foot LCS casing stickup. Aquifer test performed 9/95.
P8-GU	B1	Test	D(4-9)28dbb 55-549167	746846.80N 649293.48E	1477.7	1479.7	270	6";0-259	128-248	G	NA	8-25-95	Magma	1.5-foot LCS casing stickup. Aquifer test performed 9/95.
O12-O	B1	Monitor	D(4-9)28cdc 55-549169	744745.55N 648411.81E	1466.5	1469.06	970	4";0-950	434-929	O	380	5-18-95	Magma	2.0-foot LCS casing stickup. Aquifer test performed 6/95, 8/95, 9/95.
O12-GL	B1	Monitor	D(4-9)28cdc 55-549170	744739.89N 648436.70E	1466.2	1468.09	395	5";0-385	325-365	G	NA	5-11-95	Magma	1.6-foot LCS casing stickup. Aquifer test performed 6/95, 8/95, 9/95.
P12-O	B1	Test	D(4-9)28cdc 55-549171	744708.34N 648473.26E	1466	1467.85	999	6";0-960	440-940	O	380	5-9-95	Magma	.81-foot LCS casing stickup. Aquifer test performed 6/95, 8/95, 9/95.
O13-O	B1	Monitor	D(4-9)28cba 55-547812	746889.92N 647598.55E	1479.4	1481.48	1440	4";0-1413	770-1,393	O	650	8-2-95	Magma	1.5-foot LCS casing stickup.

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P13.2-O	B1	Test	D(4-9)28cba 55-547810	746807.64N 647653.82E	1479.2	1480.08	1400	6";0-1380	781-1,379	O	647	7-27-95	Magma	1.5-foot LCS casing stickup.
P13.1-O	B1	Test	D(4-9)28cba 55-547808	746799.40N 647551.22E	1478.5	1479.97	1475	6";0-1449	772-1,449	O	770	7-16-95	Magma	1.5-foot LCS casing stickup.
P13-GL	B1	Test	D(4-9)28cba 55-547811	746802.29N 647400.14E	1477.4	1479.29	770	6";0-760	690-760	G	NA	8-11-95	Magma	1.5-foot LCS casing stickup.
O15-O	B1	Monitor	D(4-9)28cca 55-549160	745437.85N 647505.19E	1467.5	1468.69	1330	4";0-1,315	632-1,296	O	553	7-1-95	Magma	Aquifer test performed 8/95, 9/95.
P15-O	B1	Test	D(4-9)28cca 55-549158	745428.58N 647596.44E	1468	1469.32	1380	6";0-1321	580-1300	O	485	6-20-95	Magma	Aquifer test performed 8/95, 9/95.
P15-GL	B1	Test	D(4-9)28cca 55-549161	745376.92N 647508.44E	1468.6	1468.61	500	6";0-491	421-481	G	NA	7-3-95	Magma	Aquifer test performed 8/95, 9/95.
O19-O	B1	Monitor	D(4-9)28bdc 55-549149	747413.63N 648397.07E	1482.7	1483.69	630	4";0-627	410-608	O	400	6-7-95	Magma	3.0-foot PVC casing stickup. Aquifer test performed 7/95, 9/95.
O19-GL	B1	Monitor	D(4-9)28bdc 55-549150	747359.29N 648233.62E	1481.7	1483.28	460	5";0-455	375-435	G	NA	6-14-95	Magma	1.5-foot LCS casing stickup. Aquifer test performed 7/95, 9/95.
P19.1-O	B1	Test	D(4-9)28bdc 55-549151	747345.78N 648427.94E	1483	1484.72	680	6";0-621	402-600	O	355	6-4-95	Magma	2.0-foot LCS casing stickup. Aquifer test performed 7/95, 9/95.
P19.2-O	B1	Test	D(4-9)28bdc 55-549152	747350.40N 648359.48E	1482.6	1484.23	630	6";0-622	404-602	O	420	6-8-95	Magma	1.5-foot LCS casing stickup. Aquifer test performed 7/95, 9/95.
O28-GL	B1	Monitor	D(4-9)28ddb 55-547805	745592.65N 650966.70E	1464.8	1465.66	320	4";0-307	277-307	G	NA	7-4-95	Magma	1.5-foot LCS casing stickup. Aquifer test performed 8/95, 9/95.

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O28.1-O	B1	Monitor	D(4-9)28ddb 55-547803	745652.04N 651027.87E	1464.6	1465.76	530	4";0-514	395-494	O	368	6-21-95	Magma	1.5-foot LCS casing stickup. Aquifer test performed 8/95, 9/95.
O28.2-S	B1	Monitor	D(4-9)28ddb 55-547804	745621.06N 651123.95E	1464.8	1465.54	510	4";0-495	454-494	S	340	6-19-95	Magma	1.5-foot LCS casing stickup. Aquifer test performed 8/95, 9/95.
P28-GL	B1	Test	D(4-9)28ddb 55-547807	745535.76N 651085.74E	1465	1466.48	320	5";0-309	279-309	G	NA	6-30-95	Magma	1.5-foot LCS casing stickup. Aquifer test performed 8/95, 9/95.
P28.1-O	B1	Test	D(4-9)28ddb 55-547802	745558.54N 650998.31E	1464.9	1466.48	520	6";0-509	399-499	O	360	7-2-95	Magma	1.5-foot LCS casing stickup. Aquifer test performed 8/95, 9/95.
P28.2-O	B1	Test	D(4-9)28ddb 55-547806	745516.17N 651118.23E	1465.4	1466.68	519	6";0-507	398-497	O	335	6-29-95	Magma	1.5-foot LCS casing stickup. Aquifer test performed 8/95, 9/95.
O39-O	B1	Monitor	D(4-9)28bcd 55-549174	744220.52N 649098.12E	1463.1	1464.29	916	5";0-910	474-890	O	380	5-7-95	Magma	1.6-foot LCS casing stickup. Aquifer test performed 5/95.
P39-O	B1	Test	D(4-9)28bcd 55-549176	744102.51N 649102.65E	1461.7	1462.85	915	6";0-847	471-826	O	380	5-10-95	Magma	2.0-foot PVC casing stickup. Aquifer test performed 5/95.
O49-O	B1	Monitor	D(4-9)33bba 549179	744195.29N 647517.19E	1461.8	1462.69	1280	4";0-1247	832-1227.5	O	810	6-6-95	Magma	1-foot PVC casing stickup.
O49-GL	B1	Monitor	D(4-9)33bba 55-549180	744193.98N 647477.36E	1461.2	1462.08	740	5";0-730	661-721	G	NA	6-15-95	Magma	1.1-foot PVC casing stickup.
P49-O	B1	Test	D(4-9)33bba 55-549181	744202.71N 647611.87E	1461.8	1463.12	1288	6";0-1242.5	808-1222	O	770	5-24-95	Magma	.9-foot LCS casing stickup.

Table 2.3-2. Summary of Information Concerning Existing Wells Within One-Half Mile of the Florence In-Situ Mine Area

[a]The following are other tables which correlate with wells listed in the table.
- C1, C2: Existing water quality data, Appendix C, Volume II
- B1, B2, B3: Water level data, Appendix B, Volume II
- B5, Well data included in Montgomery and Associates (1994)

[b]Feet above mean sea level (MSL)

[c]Feet below ground surface

* The well ID listed first identifies the well name most commonly used with respect to documentation and well recognition. Any other names found for a particular well are also listed as a reference.

** The correct well identification is based on location and is listed first followed by all other numbers referenced to that well as found in various reports and documents.

Table 2.3-3 **Large Municipal Water Providers, Pinal AMA, 1985**			
Provider	**Population Served**	**1985 Groundwater Use (ac-ft)**	**gpcd**
Arizona Sierra Utility Company	1,214	161	118
Arizona State Prison-Florence	4,351	913	187
Arizona Training Center	485	329	606
Arizona Water Company			
- Casa Grande System	19,836	6,062	273
- Coolidge System	8,174	1,350	147
- Stanfield System	580	100	154
Central Arizona College	839	155	165
City of Eloy	5,867	1,259	192
Maricopa Water Improvement District	709	241	303
Pinal County Housing Authority	355	147	370
Thunderbird Water Improvement District	927	112	108
Town of Florence	2,684	809	269

Source: ADWR (1991)
ac-ft - acre-feet
gpcd - gallons per capita per day

Table 2.3-4 Summary of Groundwater Use Within a 5-Mile Radius of the Florence In-Situ Mine Area			
Well Type	**Number of Registered Wells**	**Percentage of Total Registered Wells**	**Annual Withdrawal Reported to ADWR (Acre-feet) 1994**
Private Irrigation Within 5-mile radius	70	18.3	NR
Private Irrigation Within 1-mile radius	12	3.1	4,385
Irrigation (San Carlos Irrigation Project)	22	6.0	13,332
Municipal (Public Supply) (Town of Florence)	5	1.0	1,055
Municipal (Institutional) (Arizona State Prison)	2	0.5	1,284
Domestic	99	26.0	NR
Domestic/Irrigation	13	3.4	NR
Domestic/Stock/Irrigation	8	2.0	NR
Domestic/Industrial	1	0.3	NR
Domestic/Stock	12	3.0	NR
Domestic/Stock/Industrial	1	0.3	NR
Industrial	7	2.0	NR
Industrial/Irrigation	5	1.3	NR
Monitor	62	16.2	NR
Irrigation/Stock	3	0.9	NR
Stock	1	0.3	NR
Utility	1	0.3	NR
Utility/Recharge	2	0.5	NR
Unknown Use	55	14.4	NR
Test	1	0.3	NR

Source: ADWR (1995)
NR - Not Reported

Table 2.5-1. Explanation of the Following Permits		
Permit	**Permit No.**	**Description**
Resource Conservation and Recovery Act (RCRA)	AZD983481599	EPA-Exempt Small Quantity
NPDES Storm Water	AZR00A224	EPA-General Permit
Pinal County Burn	1383	Renewable every 3 months
Pinal County Air Quality	To be applied for 1996	Renewable every 5 years
Septic Tank Permits	26,500 (existing) 2-new under 2,000 gallons per day	Pinal County 2-new under APP General Permit Program
Mineral Lease	Mineral lease 11-26500	Arizona State Land Department.
UIC	To be applied for November 1995	Region IX EPA
ADWR Well Permits	Over 50 in place	Applied for as needed
Burial Agreement	A.R.S 41-865 Case No. 94-24	Arizona State Museum lead agency with Hopi Tribe, Gila River Indian Community and Magma as signatories
Programmatic Agreement required as Section 106 requirement under the UIC permit and NHPA.	In-process, sent out for signature	Region IX EPA lead agency with State Historic Preservation office, Hopi Tribe, Gila River Indian Community, Magma, Advisory Council on Historic Preservation as signatories
NPDES 404/401 Water Quality Certification	In preparation, disturbance of jurisdiction water to be less than 0.5 acres. Only a 401 Water Quality certification is required by the Corps of Engineers for the ADEQ	Army Corps of Engineers requires permit for dredge and fill of jurisdictional waters of the U.S.
Aquifer Protection	ADEQ	To protect aquifer water quality for drinking water by encouraging discharge reduction, and where practicable, by eliminating discharges to Arizona aquifers.

Table 2.8-1. Minor UIC Aquifer Exemption Request Information Summary			
		Information Location	**Comments**
A.	**General Inventory Information**		
1.	Facility name, address	This volume, Section 1.3	Magma Copper Company Florence Project 14605 East Hunt Highway Florence, Arizona 85232
2.	Owner name, address	This volume, Section 1.3	Magma Copper Company Suite 200 7400 North Oracle Road Tucson, Arizona 85704
3.	Operator/legal contact name, address	This volume, Section 1.3	Mr. John Kline Magma Copper Company 14605 East Hunt Highway Florence, Arizona 85232
4.	Project type (e.g., generation, transportation, treatment facility)	This volume, Section 2.4.3	In-situ copper mining.
5.	Operating status of injection well(s)	This volume, Section 3.1	None presently in operation.
6.	Listing of all permits or construction approvals	Volume, Section 2.5, Table 2.5-1	Mine not yet operational,; therefore, it has few permits.
B.	**Purpose of Proposed Aquifer Exemption**		
1.	Explain the purpose, need for, and intentions of the exemption, other than those listed in item B4 below.	This volume, Sections 1.1 and 2.1	The purpose of the exemption is to allow for in-situ leaching of copper, which is a primary resource mined to meet the needs of demand within the national economy.
2.	Provide a narrative description of the proposed aquifer exemption, including the proposed exempted aquifer, confining zone, boundaries, injection practices, etc. Discuss the need to inject into this zone as opposed to injecting into other zones which are not USDWs.	This volume, Section 2.1	Exemption covers area of productive orebody.
3.	A declaration that the aquifer is not now and will not in the future serve as a source of drinking water. The burden of proof is left to the applicant.	This volume, Section 1.1	The aquifer cannot now and will not in the future be used for a source of drinking water within the expected area.

Table 2.8-1. Minor UIC Aquifer Exemption Request Information Summary		
	Information Location	**Comments**
4. Reason for requesting the aquifer exemption. The reason must include either (a) and (b), or (a) and (c) below:		Request for aquifer exemption for reason (a) and (b).
a. The aquifer does not currently serve as a source of drinking water.	This volume, Section 1.0	The aquifer does not now serve as a source of drinking water.
b. The aquifer cannot now and will not in the future serve as a source of drinking water because:		
(i) The aquifer is mineral, hydrocarbon or geothermal energy producing, or can be demonstrated by a permit applicant as part of a permit application for a Class II or III operation to contain minerals or hydrocarbons that, considering their quantity and location, are expected to be commercially producible.	This volume, Section 1.0	Magma has shown through its submission of Appendix A of this volume that commercially producible quantities of copper can be produced.
(ii) The aquifer is situated at a depth or location which makes recovery of water for drinking water purposed economically or technologically impractical (a detailed economic analysis is required).	Not applicable	Justification for B-4-b-i included.
(iii) The aquifer is so contaminated that it would be economically or technologically impractical to render that water fit for human consumption (a detailed economic analysis is required).	Not applicable	Justification for B-4-b-i included.

Table 2.8-1. **Minor UIC Aquifer Exemption Request Information Summary**		
	Information Location	**Comments**
(iv) The aquifer is located over a Class III well mining area subject to subsidence or catastrophic collapse.	Not applicable	Justification for B-4-b-i included.
c. The total dissolved solids content of the groundwater is more than 3,000, and less than 10,000 mg/L and it is not reasonably expected to supply a public water system.	Not applicable	Justification for exemption under (a) and (b).
5. An estimate of the time duration of the proposed aquifer exemption.	This volume, Section 1.2	Mine life estimated at 15 years followed by 30-year post-closure period.
6. An analysis of alternatives to the proposed underground injection project for disposal of the wastes.	This volume, Section 2.7	No underground disposal of wastes. In-situ mining produces minimal waste volume in comparison to conventional mining.
7. An analysis of the environmental impacts of the proposed aquifer exemption, including any adverse environmental effects which cannot be avoided; any irreversible or irretrievable commitments of resources which would be involved should the exemption be approved; the relationship between short-term uses of the aquifer for waste disposal purpose; and the long-term benefits of maintaining the present aquifer conditions.	This volume, Section 2.7	There are no irreversible or irretrievable commitments of resource. Area will be returned to levels that does not exceed any primary MCLs.
NOTES: Item B-1: EPA will approve aquifer exemptions only for specific purposes. Any exemption request must describe the injection activities to be allowed. Additional approvals shall be required for other injection activities (e.g., non-hazardous industrial wastewater disposal into an aquifer exempted for mineral production).	This volume I, Sections 1.1 and 2.0	Injection and recovery wells are proposed specifically for the economic recovery of copper from the mineralized zone.

Table 2.8-1. Minor UIC Aquifer Exemption Request Information Summary		
	Information Location	**Comments**
Item B-4-a: At a minimum, a survey should be conducted to identify all water supply wells in the area of the proposed exempted aquifer and the buffer zone. If no water supply wells would be affected by the exemption, the request should state that a survey was conducted and no water supply wells were located which will be affected by the proposed exemption. If the proposed aquifer exemption pertains to only a portion of an aquifer, a demonstration must be made that the waste will remain within the exempted portion of the aquifer.	This volume, Section 1.1.11, and Volume IV	All water wells in a 100-square mile area surveyed including exemption request zone and buffer zone. No water supply wells outside Magma's control will be affected by proposed exemptions. Modeling techniques described in Volume IV indicate that contaminant levels above background concentrations will remain within exempted portion of aquifer.
Item B-4-b-i: The applicant for an aquifer exemption is required to furnish the data necessary to demonstrate that the aquifer is expected to be mineral or hydrocarbon producing. If the proposed aquifer exemption is to allow a Class II enhanced oil recovery well or an existing Class III injection well operation to continue, the fact that the aquifer has a history of hydrocarbon or mineral production will be sufficient proof that this standard has been met. Applicants for aquifer exemption to allow new mining must demonstrate that the aquifer is expected to contain commercially producible quantities of minerals.	This volume, Appendix A	The economic justification indicate that copper can be produced at an economically justifiable level. Supporting data is submitted Appendix A and marked "Confidential Business Information" as specified under 40 C.F.R. 144.5.

Table 2.8-1. Minor UIC Aquifer Exemption Request Information Summary		
	Information Location	**Comments**
Information contained in the mining plan for the proposed project, such as a map and general description of the mining area, general information on the mineralogy and geochemistry of the mining zone, analysis of the amenability of the mining zone to the proposed mining method, and a timetable of planned development of the mining zone, shall be required. An analysis of a sample acquired using a formation tester or coring tool shall be required to show that the aquifer contains producible levels of minerals. This should be coupled with reserve calculations and rate of return projections for the aquifer in question. Exemptions relating to any new Class II wells which will be injecting into a producing or previously produced horizon shall include the following types of information: the production history of the well if it is a former production well which is being converted; a description of any drill stem test run on the horizon in question; the production history of other wells in the vicinity which produce from the horizon in question; and a description of the project if it is an enhanced recovery operation, including the number of wells and their location.	This volume, Section 1.0 and Appendix A. Also, Volume II, Sections 1.3, 2.3, 3.8, 4.3, 4.5, and 4.7	Intend to mine orebody using in-situ/SX/EW mining techniques. Operations are intended to commence operations late 1997 and continue for approximately 15 years.
Structural contour maps and cross sections for the zone of injection, along with any available radioactive tracer surveys, would infer if the injection is going to be into a geothermal producing aquifer where steam is produced underground and at the surface.	Volume II, Figure 3.4-6 Volume II, Figure 4.3-5 Volume II, Figure 4.3-6 Volume II, Figure 4.3-1 through 4	Structural contour and cross-section maps

Table 2.8-1. Minor UIC Aquifer Exemption Request Information Summary		
	Information Location	**Comments**
Item B-4-b-ii: An economic analysis coupled with technological considerations is required from the applicant to determine if the aquifer's water could be economically pump to the surface and used as a source of water supply. Specifically, the applicant shall calculate the optimum annual yield of the aquifer and the net present value associated with the development and operation of the aquifer as a water supply source. The optimum annual yield shall be determined by identifying the location of groundwater well which would maximize the water output without dangerous depletion of the storage reserve of the aquifer. The net present value shall be determined by identifying all capital and operating costs associated with the water project and discounting these costs over the life of the project. See Section H below for additional details on economic evaluation of water supply development costs.	Not applicable	
Item B-4-iii: An economic analysis coupled with technological considerations is required to determine if the aquifer's water could be economically pumped to the surface and made fit for human consumption. See Section I below for additional details on economic evaluation of water supply treatment technology and costs.	Not applicable	
Item B-4-b-iv: The aquifer exemption request should discuss the proposed mining method and why the method necessarily causes subsidence or collapse. The possibility that non-exempted USDWs would be contaminated due to the collapse should also be addressed in the application. Structural contour maps and cross sections, pore pressure information from drilling, and mud logs for both the aquifer and the zone being mined are required.	Not applicable	

Table 2.8-1. Minor UIC Aquifer Exemption Request Information Summary		
	Information Location	**Comments**
Item B-4-c: The aquifer exemption request must include information about the equality and availability of water from the proposed exempted aquifer. Also, the exemption request must analyze the potential for public water supply use of the aquifer. Details required for this analysis are outlined in Section M below.	Not applicable	
C. Maps of Area of Proposed Aquifer Exemption		
1. Base map of area (USGS topographic map with a scale of 1:24,000 or larger; maps should extend a minimum of 1 mile beyond the proposed aquifer exemption boundaries; more than one map may be needed). The map should:	This volume, Sheet 2.1-1	
a. precisely depict, in square miles or acres, the area overlying the proposed exempted aquifer, or portion of the aquifer, both on the map and in some universal unit (e.g., latitude/longitude, distances, bearing);	This volume, Sheet 2.1-1	33° 02' 00" North 111° 25' 00" West
b. delineate in square miles or acres the boundaries of the aquifer, both on the map and in some universal unit, e.g. latitude/longitude, distances, bearing (note: this area will be larger than that in Item a. above if only a portion of the aquifer is being requested for exemption);	Volume II, Section 3.0, Figures 3.6-1(II), 3.6-2(II), and 3.6-3(II)	The Pinal Active Management area is approximately 1,100 square miles in Central Arizona. (Wickham and Corkhill, 1989)
c. delineate the boundaries of any existing or proposed aquifer exemptions both on the map and in some universal unit (e.g., latitude/longitude, distances, bearing);	This volume, Sheet 2.1-1	Latitude and Longitude 33° 02' 00" North 111° 25' 00" West

Table 2.8-1. Minor UIC Aquifer Exemption Request Information Summary	Information Location	Comments
d. show a "buffer zone" around the area of the proposed exempted aquifer (this buffer zone should be an area of limited future ground water development extending a minimum of 1/4 mile from the boundary of the proposed exempted aquifer);	This volume, Sheet 2.1-1	Point of Compliance (POC) groundwater quality monitoring well array.
e. show the location of all monitoring wells completed, or to be completed, in the buffer zone to assure that injected fluids do not migrate from the exempted aquifer; and delineate the boundaries of all property owners and holders of water rights within the area of the proposed exempted aquifer and buffer zone for the purpose of public notification (include a list of names and mailing addresses).	This volume, Figure 2.1-2	Planned and existing POC wells have been established downgradient of the proposed mine area.
2. Topographic map showing all wells in the area of the proposed exempted aquifer and buffer zone (same scale as above) with accompanying explanation or table to include:	Volume II, Figure 2.1-2(II) See tables in Volume II, Appendix B.	Appendix B contains existing well and water level data.
a. well identification (name and number)	Volume II, Section 2.3, Table 2.3-3 This volume, Table 2.3-2	ADWR registration number
b. well type (e.g., production, injection, irrigation, water supply, enhanced recovery, monitoring abandoned, dry holes)	Volume II, Section 2.1, Figure 2.1-2(II), Section 2.3, Table 2.3-3	Wells include monitoring aquifer test pumping and observation wells, and irrigation wells.
c. well depth	Volume II, Section 2.3, Table 2.3-3	Range 200 to 1,600 feet below ground surface.
d. status (e.g., active, inactive, plugged, abandoned)	Volume II, Section 2.3, Table 2.3-3 Active but not involved in-situ mining	All wells are active, abandonment plans for existing and planned wells have been established as part of the mining plan.
e. date drilled and dates of significant workovers	No mining wells in area.	

Table 2.8-1. Minor UIC Aquifer Exemption Request Information Summary			
		Information Location	**Comments**
f.	construction information (including cement, casing, tubing, completion type, and plugging records)	Volume II, Section 5.2.3, Table 2.3-3 Volume II, Appendix A	
g.	perforated interval	Volume II, Section 2.3, Table 2.3-3	Well ore perforated in water bearing stratigraphic units include UBFU, LBFU, oxider sulfide bedrock zones.
h.	location (township, range, section)	This volume, Section 3.1, UIC Form 4	Located in Township 4 South, Range 9 East, Section 22, 28 and 33, 34.
i.	corrective/remedial action for improperly plugged wells	Not applicable	
j.	history of injection operations (existing wells only)	Not applicable	
3.	Map showing the location of the closest domestic and public water supply wells with tables of relevant information such as number of users, depth of water wells with aquifer names, and water quality information.	This volume, Sheet 2.1-1	Presently 382 registered wells within a 5-mile radius of the proposed in-situ mine area.
D.	**Maps and Cross Sections of USDWs**		
1.	Geologic cross sections (two perpendicular sections) showing:	Volume II, Section 3.4, Figures 3.4-2(II) and 3.4-3(II) Volume II, Section 4.3, Figures 4.3-1(II), 4.3-2(II), 4.3-3(II), and 4.3-4(II)	Section 3.4 figures regional cross sections Section 4.3 figures are in-situ mine area cross sections.
a.	geologic formations	Volume II, Section 3.4, Figures 3.4-2(II) and 3.4-3(II) Volume II, Section 4.3, Figures 4.3-1(II), 4.3-2(II), 4.3-3(II), and 4.3-4(II)	Section 3.4 figures regional cross sections. Section 4.3 figures are in-situ mine area cross sections.
b.	structural features	Volume II, Section 3.4, Figures 3.4-2(II) and 3.4-3(II) Volume II, Section 4.3, Figures 4.3-1(II), 4.3-2(II), 4.3-3(II), and 4.3-4(II)	Section 3.4 figures regional cross section. Section 4.3 figures are in-situ mine area cross sections.
c.	TDS levels for each formation	Volume II, Sections 3.8 and 4.5, Figure 4.5-2(II) Volume III, Appendix D	Range 790 to 1,400 mg/L.
d.	underground sources of drinking water	Not applicable	
e.	proposed exempted aquifer	This volume, Sheet 2.1-1	
f.	confining zone	Not applicable	

Table 2.8-1. Minor UIC Aquifer Exemption Request Information Summary				
			Information Location	Comments
2.	Isopach maps (2)			
	a.	proposed exempted aquifer	Volume II, Section 4.3, Figures 4.3-9(II), 4.3-10(II), 4.3-11(II), and 4.3-12(II)	
	b.	injection zone	Volume II, Section 4.3	Oxide bedrock zone
E.	**Maps and Cross Sections of Geologic Structure of Area**			
1.	Geologic maps			
	a.	local area	Volume II, Section 2.1, Figure 2.1-1(II)	
	b.	regional setting	Volume II, Section 3.4, Figure 3.4-1(II)	
2.	Structural contour map (mapped to top of proposed exempted aquifer)		Volume II, Section 3.4, Figure 4.3-8(II) Volume II, Section 4.3, Figures 4.3-5(II) and 4.3-6(II)	
3.	Stratigraphic column (local area)		Volume II, Section 3.4, Figure 3.4-5(II)	
	a.	lithology of each formation	Volume II, Sections 3.7 and 4.3.1	
	b.	mineralogy of proposed exempted aquifer and confining zones	Volume II, Section 4.3.2	
	c.	thickness of each formation	Volume II, Section 4.3.2	
	d.	hydraulic conductivity/permeability of proposed exempted aquifer and confining zones	Volume II, Sections 3.7 and 4.3.2	
	e.	salinity profile (TDS)	Volume II, Section 4.5, Figure 4.5-2(II)	
	f.	10,000 mg/L TDS baseline (freshwater baseline)	Volume II, Section 4.5, Figure 4.5-2(II)	
	g.	geologic time scale	Volume II, Section 3.4, Figure 3.4-5(II)	
4.	Stratigraphic column (regional setting)		Volume II, Section 3.4, Figure 3.4-5(II)	
5.	Regional geology (narrative description)		Volume II, Section 3.4	
	a.	regional structural geology	Volume II, Section 3.4	
	b.	regional stratigraphy	Volume II, Section 3.4	
	c.	seismic activity	Volume II, Section 3.5.2	
	d.	tectonic history	Volume II, Section 3.4	

Table 2.8-1. Minor UIC Aquifer Exemption Request Information Summary			
		Information Location	**Comments**
F.	**Operating Data and Injection Procedures**	This volume, Section 2.4	
1.	Injection rate (average, maximum)	APP Volume I, Sections 4.2.1 and 4.5.2	Range 0.1 to 0.2 gallons per linear foot of injection on screen not to exceed fracture gradient pressure
2.	Injection pressure (average, maximum)	APP Volume I, Sections 4.2.1 and 4.5.2	Less than 75 psi
3.	Annular fluid (type, volume, additives, pressure, density/specific gravity)	Not applicable	Due to design of well
4.	Proposed injection procedures	APP Volume I, Section 4.5.2.1	
5.	Injection fluid characteristics	APP Volume I, Section 4.3	
	a. narrative description of individual waste streams	APP Volume I, Section 4.3	Minimal waste produced by in-situ mining
	b. mix ratio (average, maximum, daily) of waste streams (if applicable)	Not applicable	
	c. RCRA waste characterization (for hazardous wastes refer to 40 C.F.R. 261 subparts C and D)	Not applicable	
	d. cumulative analysis of commingled injectate (if applicable)	Not applicable	
	e. detailed description of sampling and analytical methods	Not applicable	
	f. analysis of chemical, physical, radiological and biological characteristics, including temperature, pH, density, and corrosiveness	Volume V, Appendix F	See MSDS sheets
	g. compatibility of waste stream(s) with receiving formation, well components, and other waste streams	Not applicable	
6.	Source of water (e.g., produced, facility supply well, municipal supply)	Volume II, Sections 3.9 and 4.6	Facility supply well.

Table 2.8-1. Minor UIC Aquifer Exemption Request Information Summary			
		Information Location	Comments
G.	**Formation Testing Program**		
1.	Analysis of representative formation water sample (analysis of formation fluid to be conducted by an independent laboratory; analysis must address EPA Drinking Water Standards, i.e., MCLs and TDS at a minimum)	Volume II, Sections 3.8 and 4.5	
2.	Description of sampling and analytical procedures	Volume II, Section 2.3.4 Volume III	
3.	Direction and rate of regional groundwater flow	Volume II, Section 3.7, Volume IV	
4.	Direction and rate of injected fluid migration	Volume IV	
5.	Salinity (TDS) profiles (include all calculation procedures and logs)	Volume II, Section 3.8.3	
6.	Results of, or proposed, injectivity testing	Volume II, Section 4.3.2,5	
7.	Hydrogeology of confining zone	Volume II	Discusses no confining zone
	a. thickness		
	b. age		
	c. lithology		
	d. mineralogy (if available)		
	e. structure (presence of faults, fractures, or cavities)	Not applicable	No confining zone
	f. description of vertical and lateral continuity (e.g., depositional environment, facies changes, unconformities, and vertical and lateral extent of clay layers)	Not applicable	No confining zone
	g. hydrologic parameters	Not applicable	No confining zone
	(i) hydraulic conductivity or permeability	Not applicable	No confining zone
	(ii) porosity	Not applicable	No confining zone

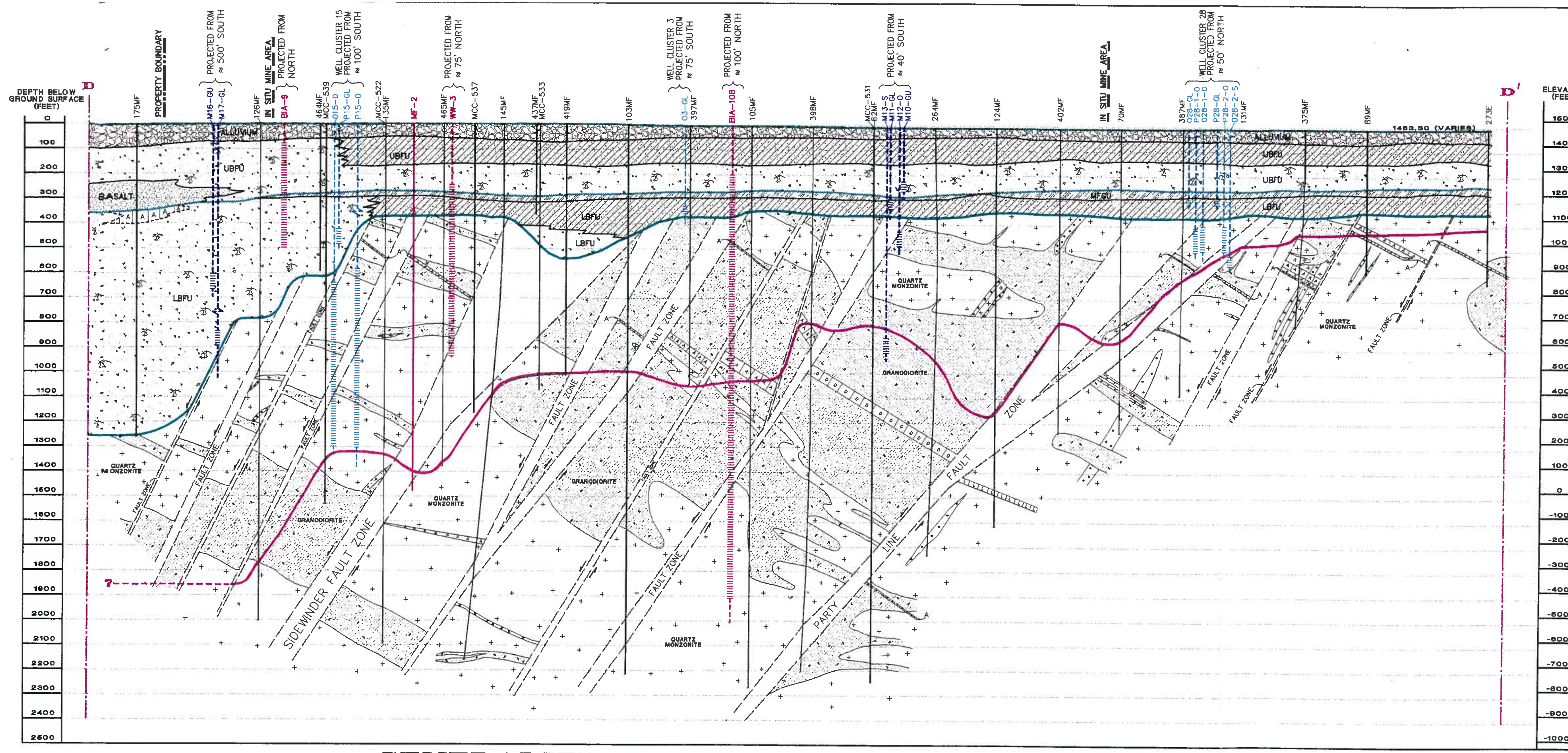
Table 2.8-1. Minor UIC Aquifer Exemption Request Information Summary	Information Location	Comments
(iii) oil/water saturation	Not applicable	No confining zone
(iv) compressibility	Not applicable	No confining zone
(v) formation fracture pressure, from testing or calculations	Not applicable	No confining zone
h. potentiometric surface map	Not applicable	No confining zone
8. Hydrogeology of proposed exempted aquifer	Volume II, Section 4.0	
a. thickness	Volume II, Section 4.3.3	
b. age	Volume II, Section 4.3.3	
c. lithology	Volume II, Section 4.3.3	
d. mineralogy (if available)	Volume II, Section 4.3.3	
e. structure (presence of faults, fractures, or cavities)	Volume II, Section 4.3.3	
f. description of vertical and lateral continuity (e.g., depositional environment, facies changes, unconformities, presence of clay layers/lenses)	Volume II, Section 4.3.3	
g. hydrologic parameters	Volume II, Section 4.3	
(i) hydraulic conductivity or permeability	Volume II, Section 4.3	
(ii) porosity	Volume II, Section 4.3	
(iii) reservoir pressure	Volume II, Section 4.3	
(iv) storage coefficient	Volume II, Section 4.3	
(v) oil/water saturation	Not applicable	
(vi) compressibility	Volume II, Section 4.3	
(vii) formation fracture pressure, from testing or calculations	Volume II, Section 4.3	
h. potentiometric surface map	Volume II, Section 4.3, Figures 4.3-9(II), 4.3-10(II), 4.3-11(II), and 4.3-12(II)	

Table 2.8-1. Minor UIC Aquifer Exemption Request Information Summary			
		Information Location	**Comments**
H.	**Technological and Economic Analysis of Aquifer Development as Water Supply**	Not applicable	
	Technological and economic evaluations shall consider the availability of alternative supplies of water, the adequacy of alternative sources to meet present and future water needs, and a demonstration that there are major costs for treatment and/or development associated with the use of the aquifer as a source of water supply. The evaluation shall consider the above factors and the following:	Not applicable	
	1. Distance from the proposed exempted aquifer to public water supplies.	Not applicable	
	2. Current sources of water supply for potential users of the proposed exempted aquifer.	Not applicable	
	3. Availability and quality of alternative water supply sources.	Not applicable	
	4. Analysis of future water supply needs within the general area.	Not applicable	
	5. Depth of the proposed exempted aquifer.	Not applicable	
	6. Quality of the water in the proposed exempted aquifer.	Not applicable	
	7. The costs to develop the proposed exempted aquifer as a water supply source, including any treatment costs and costs to develop alternative water supplies. This should also include costs of well construction, transportation, water treatment, etcetera, for each source.	Not applicable	

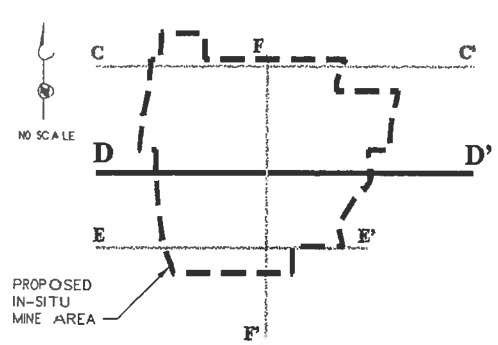
Table 2.8-1.. Minor UIC Aquifer Exemption Request Information Summary		
	Information Location	**Comments**
I. Technological and Economic Analysis of Aquifer Water Treatment	Not applicable	
Technological and economic evaluations shall consider the source, type, and severity of contamination in the proposed exempted aquifer, the availability of alternative supplies of water, the adequacy of alternative sources to meet present and future water needs, and a demonstration that there are major costs for treatment and/or development associated with the use of the aquifer as a source of water supply. The evaluation shall consider the above factors and the following:	Not applicable	
1. Concentration and types of contaminants in the aquifer.	Not applicable	
2. Source of contamination.	Not applicable	
3. Whether the contamination source has been abated.	Not applicable	
4. Extent of the contaminated area.	Not applicable	
5. Probability that the contaminant plume will pass the proposed exempted area.	Not applicable	
6. Availability of treatment technology to remove contaminants from the water.	Not applicable	
7. Chemical content of proposed injection fluids.	Not applicable	
8. Current water supply in the area.	Not applicable	
9. Alternative water supplies.	Not applicable	
10. Costs to develop current and probable future water supply from proposed exempted aquifer. This should include well construction costs, transportation costs, water treatment costs, etcetera.	Not applicable	

Table 2.8-1. Minor UIC Aquifer Exemption Request Information Summary		
	Information Location	**Comments**
11. Projections on future use of the proposed exempted aquifer.	Not applicable	

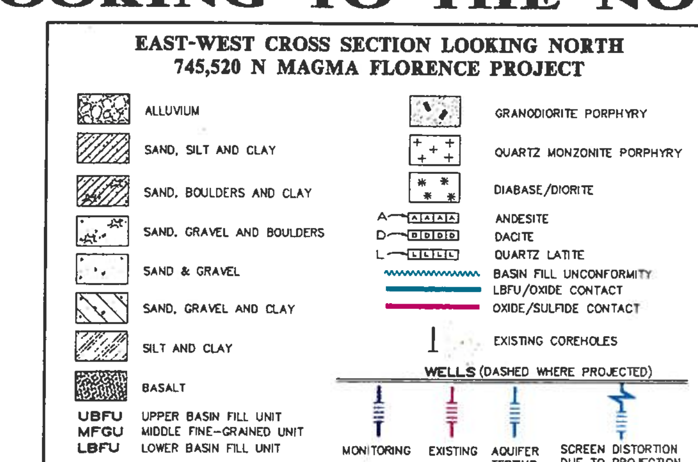
mg/L - milligrams per liter
psi - pounds per square inch
EPA - Environmental Protection Agency
MCLs - Maximum Contaminant Level
SX/EW - Solution Extraction/Electrowinning
UBFU - Upper Basin-Fill Unit
LBFU - Lower Basin-Fill Unit
USDW - Underground Source of Drinking Water
TDS - Total Dissolved Solids
RCRA - Resource Conservation and Recovery Act
USGS - United States Geologic Survey
NA - Not applicable



GENERALIZED GEOLOGIC CROSS-SECTION D-D'
VIEW LOOKING TO THE NORTH



KEY MAP



NOTE:
DEPICTIONS OF WELL PROJECTED ONTO SECTION ARE ADJUSTED TO PLACE SCREENS IN PROPER GEOLOGIC VIEW

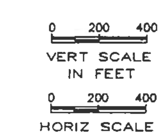


Figure 2.1-1 (UIC)
HYDROGEOLOGIC CROSS-SECTION D-D'

MAGMA
MAGMA COPPER COMPANY
Florence Mining Division

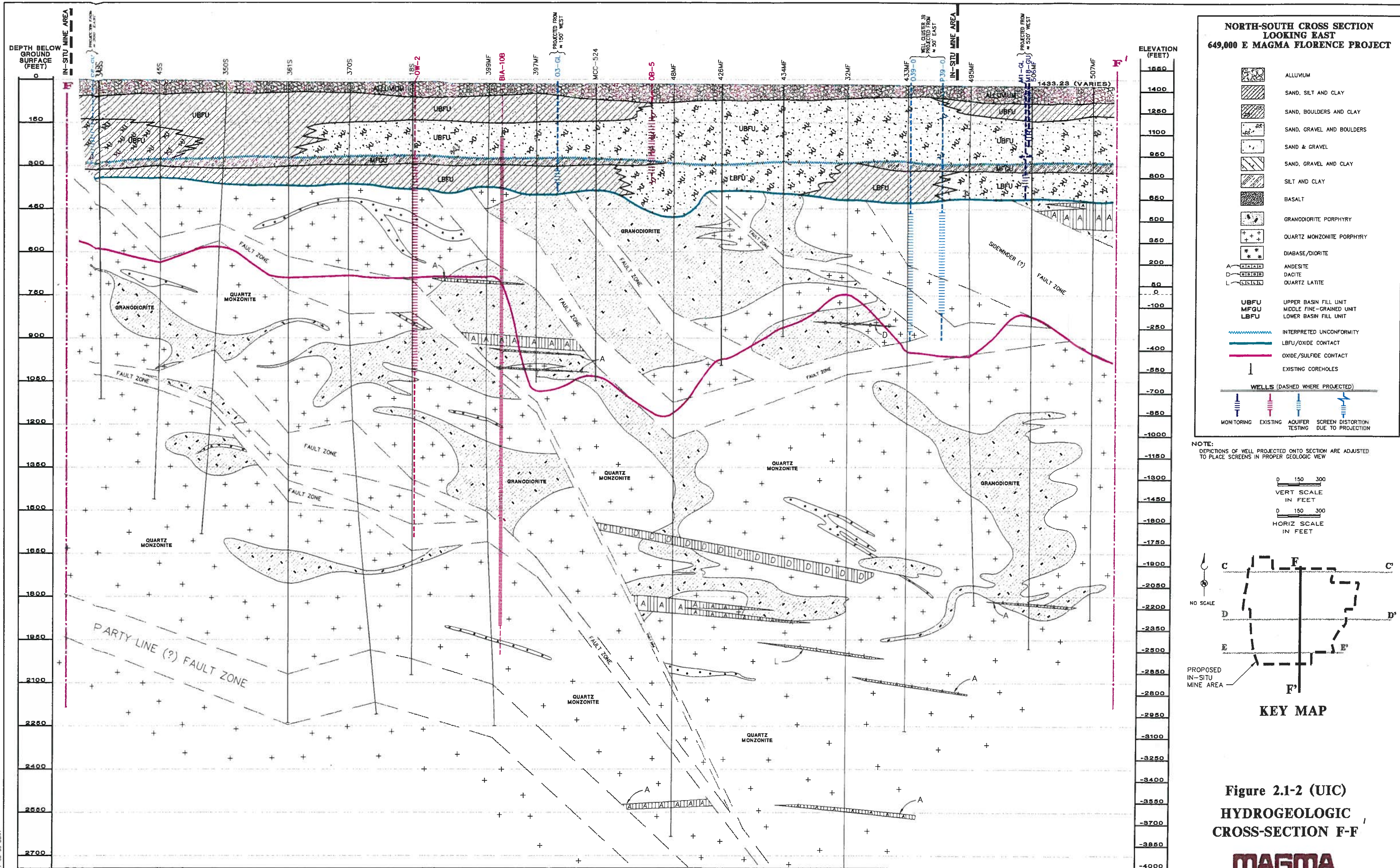


Figure 2.1-2 (UIC)
HYDROGEOLOGIC CROSS-SECTION F-F'

MAGMA
MAGMA COPPER COMPANY
Florence Mining Division

GENERALIZED GEOLOGIC CROSS-SECTION F-F'
VIEW LOOKING TO THE EAST

Original enclosed map Figure 2.2-1 included information about protected archeological sites.

EPA has removed this map because it is related to the NHPA records.

3

SECTION 3.0

UNDERGROUND INJECTION CONTROL (UIC) PERMIT APPLICATION FORM 4

3.1 FORM 4

A completed and signed Form 4 is presented on the next page.

3.2 FORM 4 CHECKLIST

A checklist and cross-reference is provided in Table 3.2-1 to assist the review in locating information required under Item XI of Form 4.

Form Approved. OMB No. 2040-0042. Expires 3-31-95

Form 4 UIC

EPA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

UNDERGROUND INJECTION CONTROL PERMIT APPLICATION

(Collected under the authority of the Safe Drinking Water Act. Sections 1421, 1422, 40 CFR 144)

I. EPA ID NUMBER: AZD983481599 (Exempt small quantity) | U | T/A | C

READ ATTACHED INSTRUCTIONS BEFORE STARTING

FOR OFFICIAL USE ONLY

Application approved (mo day year)	Date Received (mo day year)	Permit/Well Number	Comments

II. FACILITY NAME AND ADDRESS

Facility Name: Magma Florence Project

Street Address: 14605 East Hunt Highway

City: Florence   State: AZ   ZIP Code: 85322

III. OWNER/OPERATOR AND ADDRESS

Owner/Operator Name: Magma Copper Company

Street Address: 7400 Oracle Road

City: Tucson   State: AZ   ZIP Code: 85704

IV. OWNERSHIP STATUS (Mark 'x')

☐ A. Federal ☐ B. State ☒ C. Private ☐ D. Public ☐ E. Other (Explain)

V. SIC CODES

1021

VI. WELL STATUS (Mark 'x')

☐ A. Operating — Date Started (mo day year) ☐ B. Modification/Conversion ☒ C. Proposed

VII. TYPE OF PERMIT REQUESTED (Mark 'x' and specify if required)

☐ A. Individual ☒ B. Area

Number of Existing wells: No UIC wells

Number of Proposed wells: approx. 3,000

Name(s) of field(s) or project(s):

VIII. CLASS AND TYPE OF WELL (see reverse)

A. Class(es) (enter code(s))	B. Type(s) (enter code(s))	C. If class is "other" or type is code 'x,' explain	D. Number of wells per type (if area permit)
III	G		3,000 Type G

IX. LOCATION OF WELL(S) OR APPROXIMATE CENTER OF FIELD OR PROJECT

C	A. Latitude Deg	Min	Sec	B. Longitude Deg	Min	Sec	Twsp	Range	Sec	¼ Sec	Feet from	Line	Feet from	Line
I	33	02	00	111	25	00	4S	9E	28	with portions of adjoining sections				

X. INDIAN LANDS (Mark 'x')

☐ Yes ☒ No

XI. ATTACHMENTS

(Complete the following questions on a separate sheet(s) and number accordingly; see instructions)

FOR CLASSES I, II, III (and other classes) complete and submit on separate sheet(s) Attachments A — U (pp 2-6) as appropriate. Attach maps where required. List attachments by letter which are applicable and are included with your application:

XII. CERTIFICATION

I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. (Ref. 40 CFR 144.32)

A. Name and Title (Type or Print): Bradford A. Mills, Executive Vice President

B. Phone No. (Area Code and No.): (520) 575-5600

C. Signature: Bradford A. Mills

D. Date Signed: January 16, 1996

TABLES

Table 3.2-1. Form 4 - Underground Injection Control (UIC) Permit Application - Information Summary		
Information Requirement	**Information Location**	**Comments**
I. Environmental Protection Agency (EPA) Identification Number Fill in your EPA Identification Number. If you do not have a number, leave blank.		RCRA-AZD983481599 EPA - Exempt Small Quantity UIC - In progress Region IX EPA
II. Facility Name and Address Name of well, well field or company and address.	This volume, Section 1.3	Magma Florence Project 14605 East Hunt Highway Florence, Arizona 85232
III. Owner/Operator Name and Address Name and address of owner/operator of well or well field.	This volume, Section 1.3	Magma Copper Company 7400 Oracle Road, Suite 200 Tucson, Arizona 85704
IV. Ownership Status Mark the appropriate box to indicate the type of ownership.	This volume, Section 1.3	C. Private
V. Standard Industrial Classification (SIC) Code List at least one and no more than four SIC Codes that best describe the nature of the business in order of priority.	UIC Form 4	SIC Code 1021
VI. Well Status Mark Box A if the well(s) were operating as injection wells on the effective date of the UIC Program for the State. Mark Box B if the well(s) existed on the effective date of the UIC Program for the State but were not utilized for injection. Box C should be marked if the application is for an underground injection project not constructed or not completed by the effective date of the UIC Program for the State.	UIC Form 4	C. Proposed

Table 3.2-1. Form 4 - Underground Injection Control (UIC) Permit Application - Information Summary		
Information Requirement	**Information Location**	**Comments**
VII. Type of Permit Mark "Individual" or "Area" to indicate the type of permit desired. Note that area permits are at the discretion of the Director and that wells covered by an area permit must be at one site, under the control of one person and do not inject hazardous waste. IF an area permit is requested the number of wells to be included in the permit must be specified and the wells described and identified by location. If the area has a commonly used name, such as the "Jay Field", submit the name in the space provided. In the case of a project or field which crosses State lines, it may be possible to consider an area permit if EPA has jurisdiction in both States. Each such case will be considered individually, if the owner/operator elects to seek an area permit.	This volume, UIC Form 4, Section 3.2	B. Area Permit Approximately 3,000 proposed wells Magma Florence Project
VIII. Class and Type of Well Enter in these two positions the class and type of injection well for which a permit is requested. Use the most pertinent code selected from the list on the reverse side of Form 4. When selecting type X, please explain in the space provided.	This volume, UIC Form 4, Section 3.2	Class III, Type G (solution mining well)
IX. Location of Well Enter the latitude and longitude of the existing or proposed well expressed in degrees, minutes, and seconds or the location by township, and range, and section, as required by 40 C.R.F. 146. If an area permit is being requested, give the latitude and longitude of the approximate center of the area.	This volume, UIC Form 4, Section 3.2	Township 4 South, Range 9 East, Sections 27, 28, 33 and 34 Latitude 33° 02' 00" North Longitude 111° 25' 00" West (Center of Magma Florence Project)
X. Indian Lands Place an "X" in the box if any part of the facility is located on Indian lands.	This volume, UIC Form 4, Section 3.2	No part of the facility is located on Indian lands.

Table 3.2-1. Form 4 - Underground Injection Control (UIC) Permit Application - Information Summary		
Information Requirement	**Information Location**	**Comments**
XI. Attachments Note that information requirements vary depending on the injection well class and status. Attachments for Class I, II, and III are described on pages 4 and 5 of this document and listed by Class on page 2. Place EPA ID number in the upper right hand corner of each page.		
A. Area of Review Methods Give the methods and, if appropriate, the calculations used to determine the size of the area of review (fixed radius or equation). The area of review shall be a fixed radius of 1/4 mile from the well bore unless the use of an equation is approved in advance by the Director.	UIC Volume I, Table B; maps showing area provided in Volumes II, IV, and V	The area of review includes a 100-square mile area surrounding the proposed in-situ mine area. The in-situ area permit covers the 214 acres of the study area, with focus on impacts on the proposed aquifer exemption area. Since this is an area permit submission, the study area incorporates all of the areas within the proposed aquifer exemption. Models presented in APP Volume IV indicate no impact outside exemption area.
B. Maps of Wells/Area and Area Review Submit a topographic map, extending 1 mile beyond the property boundaries, showing the injection well(s) or project area for which a permit is sought and the applicable area of review. The map must show all intake and discharge structures and all hazardous waste, treatment, storage, or disposal facilities. If the application is for an area permit, the map should show the distribution manifold (if applicable) applying injection fluid to all wells in the area, including all system monitoring points. Within the area of review, the map must show the following:	This volume, Sheet 2.1-1 Maps, Volume II Sheet 1.2-2 (II) Maps Volume II, Sheet 3.6-1 (II) Volume V, Section 1.0 Volume V, Appendix A	Proposed system monitoring points Wells within 1/4 mile of project, including pubic water systems Operational components, including structures, treatment areas, storage areas and distribution elements. (Exact production well locations to be within proposed in-situ mine area.) There are no intake or discharge structures, nor are there any TSDF in the area.

Table 3.2-1. Form 4 - Underground Injection Control (UIC) Permit Application - Information Summary		
Information Requirement	**Information Location**	**Comments**
Class I		
The number, or name, and location of all producing wells, injection wells, abandoned wells, dry holes, surface bodies of water, springs, mines (surface and subsurface), quarries, and other pertinent surface features, including residences and roads, and faults, if known or suspected. In addition, the map must identify those wells, springs, other surface water bodies, and drinking water wells located with 1/4 mile of the facility property boundary. Only information of public record is required to be included on this map;	NA	
Class II		
In addition to requirements for Class I, include pertinent information known to the applicant. This requirement does not apply to existing Class II wells;	NA	
Class III		
In addition to requirements for Class I, include public water systems and pertinent information known to the applicant. a) Producing wells, injection wells, abandoned wells, dry holes. b) Surface bodies of water springs. c) Mines. d) Map of roads, etcetera.	Refer to heading XI B. Volume II, Figure 3.3-1	a. None of these wells. b. None. c. Approximately 1.25 miles of underground drifts with 400 coreholes.
C. Corrective Action Plan and Well Data Submit a tabulation of data reasonably available form public records or otherwise known to the applicant on all wells within the area of review, including those on the map required in B, which penetrate the proposed injection zone. Such data shall include the following:	Volume II, Appendix B Sheet 2.1-2 (UIC) Volume V, Appendix E	Well location of corehole for 5-mile radius Well and corehole abandonment plan

Table 3.2-1. Form 4 - Underground Injection Control (UIC) Permit Application - Information Summary		
Information Requirement	**Information Location**	**Comments**
Class I		
A description of each well's type, construction, date drilled, location, depth, record of plugging and/or completion, and any additional information the Director may require. In the case of new injection wells, include the corrective action proposed to be taken by the applicant under 40 C.F.R. 144.55.	NA	
Class II		
In addition to requirements for Class I, in the case of Class II wells operating over the fracture pressure of the injection formation, all known wells within the area of review which penetrate formations affected by the increase in pressure. This requirement does not apply to existing Class II wells.	NA	
Class III		
In addition to requirements for Class I, the corrective action proposed under 40 C.F.R. 144.55 for all Class III wells. a. Class I information requirement. b. Abandonment plan and corrective action.	Refer to XI.C. heading. a. See Appendix B, Volume II. b. Sheet 2.1-1 (UIC) c. Section 2, Volume V.	 a. Water level and existing well data in 5-mile radius. b. Roads, structures, etcetera. c. Corrective action plan.
D. Maps and Cross-Sections of Underground Sources of Drinking Water (USDWs) Submit maps and cross sections indicating the vertical limits of all underground sources of drinking water within the area of review (both vertical and lateral limits for Class I), their position relative to the injection formation and the direction of water movement, where known, in every underground source of drinking water which may be affected by the proposed injection. (Does not apply to Class II wells.)	Volume II, Sections 3.0 and 4.0 Volume II, Sheet 3.6-1(II) This volume, Figure 2.1-1 This volume, Figure 2.1-2	 Regional map. East-west cross-section. North-south cross-section.

Table 3.2-1. Form 4 - Underground Injection Control (UIC) Permit Application - Information Summary		
Information Requirement	**Information Location**	**Comments**
E. Name and Depth of USDWs (Class II) For Class II wells, submit geologic name, and depth to bottom of all underground sources of drinking water which may be affected by the injection.		Does not apply.
F. Maps and Cross-Sections of Geologic Structure of Area Submit maps and cross sections detailing the geologic structure of the local area (including the lithology of injection and confining intervals) and generalized maps and cross sections illustrating the regional geologic setting. (Does not apply to Class II wells.)	Volume II, Figure 4.3-1 Volume II, Figure 4.3-2 Volume II, Figure 4.3-3 Volume II, Figure 4.3-4	Detailed site characterization in Volume II. Cross-sections in figures are noted.
G. Geological Data on Injection and Contingency Zones (Class II) For Class II wells, submit appropriate geological data on the injection zone and confining zones including lithologic description, geological name, thickness, depth and fracture pressure.		Does not apply.
H. Operating Data Submit the following proposed operating data for each well (including all those to be covered by area permits:	a. Volume V, Section 2.0	a) Operating procedures
1. average and maximum daily rate and volume of the fluids to be injected;	Volume V, Section 1	
2. average and maximum injection pressure;	Volume V, Section 1	
3. nature of annulus fluid;	No annulus	No annulus.
4. for Class I wells, source and analysis of the chemical, physical, radiological and biological characteristics, including density and corrosiveness, of injection fluids;	NA	No Class I wells are proposed
5. for Class II wells, source and analysis of the physical and chemical characteristics of the injection fluid; and	NA	No class II wells are proposed.

Table 3.2-1. Form 4 - Underground Injection Control (UIC) Permit Application - Information Summary		
Information Requirement	**Information Location**	**Comments**
6. for Class III wells, a qualitative analysis and ranges in concentrations of all constituents of injected fluids. If the information is proprietary, maximum concentrations only may be submitted, but all records must be retained.	APP Volume I, Section 4.3 Table 4.3-1 Volume IV, Section 3	Injected fluid generally consists of a weak sulfuric acid.
I. Formation Testing Program Describe the proposed formation testing program.	Volume II, Section 2.0	
For Class I wells the program must be designed to obtain data on fluid pressure, temperature, fracture pressure, other physical, chemical, and radiological characteristics of the injection matrix and physical and chemical characteristics of the formation fluids.	NA	No Class I wells are proposed.
For Class II wells the testing program must be designed to obtain data on fluid pressure, estimated fracture pressure, physical and chemical characteristics of the injection zone. (Does not apply to existing Class II wells or projects.)	NA	No Class II wells are proposed.
For Class III wells the program must be designed to obtain data on fluid pressure, fracture pressure, and physical and chemical characteristics of the formation fluids if the formation is naturally water bearing. Only fracture pressure is required if the formation is not water bearing. (Does not apply to existing Class III wells or projects.)	Volume II, Section 2.0. Volume II, Appendix C.	Data was obtained during this investigation pertaining to formation characteristics. Section 2 (II) contains analysis of hydraulic and packer tests, existing groundwater data.
J. Stimulation Program Outline any proposed stimulation program.		A stimulation program may include over pressuring, jetting, or other well stimulation prior to operation.
K. Injection Procedures Describe the proposed injection procedures including pump, surge, tank, etcetera.	Volume V, Section 2 for well operations. Volume V, Section 1 for facility operation.	Injection pressure at the wellhead shall be calculated so as to assure that pressure in the injection zone during injection does not initiate new fractures or propagate existing fractures in the injection zone.

Table 3.2-1. Form 4 - Underground Injection Control (UIC) Permit Application - Information Summary		
Information Requirement	**Information Location**	**Comments**
L. Construction Procedures Discuss the construction procedures (according to § 146.12 for Class I, § 146.22 for Class II, and § 146.32 for Class III) to be utilized. This should include details of the casing and cementing program, logging procedures, deviation checks, and the drilling, testing and coring programs, and proposed annulus fluid. (Request and submission of justifying data must be made to use an alternative to a packer for Class I.)	Volume V, Section 2.0	All new Class III wells shall be cased and cemented to prevent the migration of fluids into or between underground sources of drinking water. The wells will meet the requirement of 146.32. Because wells will be drilled on an annual basis, and this exemption is for an area permit, only a typical well is shown.
M. Construction Details Submit schematic or other appropriate drawings of the surface and subsurface construction details of the well.	Volume V, Section 2.0 Volume V, Figure 2.2-2(V)	Final well construction details will be submitted prior to initiation of mining operations. Typical well design.
N. Changes in Injected Fluid Discuss expected changes in pressure, native fluid displacement, and direction of movement of injected fluid. (Class III wells only.)	Volume V, Section 2.0 Volume IV	No changes in pressure, native fluid displacement or movement of injected fluid are expected beyond the mining area. Volume IV discussed the modeling and fluid movement.
O. Plans for Well Failures Outline contingency plans (proposed plans, if any, for Class II) to cope with all shut-ins or well failures, so as to prevent migration of fluids into any USDW.	Volume V, Section 2.0	
P. Monitoring Program Discuss the planned monitoring program. This should be thorough, including maps showing the number and location of monitoring wells as appropriate and a discussion of monitoring devices, sampling frequency, and parameters measured. If a manifold monitoring program is utilized, pursuant to § 146.23(bX5), describe the program and compare it to individual well monitoring.	Volume V, Section 1.9 Volume III Volume V	Injection pressures will be monitored by manifold for discrete sets of wells on a daily basis. See Volume III: Groundwater sampling and analysis plan. See operational description in Section 1 of Volume V

Table 3.2-1. Form 4 - Underground Injection Control (UIC) Permit Application - Information Summary		
Information Requirement	**Information Location**	**Comments**
Q. Plugging and Abandonment Plan Submit a plan for plugging and abandonment of the well including:	Volume V, Appendix E Volume V, Section 2.0	Plugging and abandonment will be performed in accordance with information required on EPA Form 7520-14 and Arizona Department of Water Resources regulations.
Submit a plan for plugging and abandonment of the well including:		
1. describe the type, number, and placement (including the elevation of the top and bottom) of plugs to be used;	Volume V, Appendix E	
2. describe the type, grade, and quantity of cement to be used; and	Volume V, Appendix E	
3. describe the method to be used to place plugs.	Volume V, Appendix E	
Also for a Class III well that underlies or is in an exempted aquifer, demonstrate adequate protection of USDWs. Submit this information on EPA Form 7520-14, Plugging and Abandonment Plan.	Form 7520-14	To be submitted as wells are closed
R. Necessary Resources Submit evidence such as a surety bond or financial statement to verify that the resources necessary to close, plug or abandon the well are available.	APP Volume I, Section 3.0	See 10K form, and letter of assurance signed by Chief Financial Officer of Magma Copper Company.
S. Aquifer Exemptions If an aquifer exemption is requested, submit data necessary to demonstrate that the aquifer meets the following criteria:	This volume, see Table 2.8 for items 1, 2, and 3 below	Includes discussions pertaining to items 1-3. Underground sources of drinking water have been identified, including descriptions of geographic and geometric characteristics.
1. does not serve as a source of drinking water;		
2. cannot now and will not in the future serve as a source of drinking water; and		
3. the TDS content of the groundwater is more than 3,000 and less than 10,000 mg/l and is not reasonably expected to supply a public water system.		

Table 3.2-1. Form 4 - Underground Injection Control (UIC) Permit Application - Information Summary		
Information Requirement	**Information Location**	**Comments**
Data to demonstrate that the aquifer is expected to be mineral or hydrocarbon producing, such as general description of the mining zone, analysis of the amenability of the mining zone to the proposed method, and time table for proposed development must also be included. For additional information on aquifer exemptions, see 40 C.F.R. 144.7 and 146.4.		
T. Existing EPA Permits List program and permit number of any existing EPA permits, for example, NPDES, PSD, RCRA, etcetera.	This volume, Section 2.5.	
U. Description of Business Give a brief description of the nature of the business.	This volume, Section 1.0.	
XII. Certification		
All permit applications (except Class II) must be signed by a responsible corporate officer for a corporation, by a general partner for a partnership, by the proprietor of a sole proprietorship, and by a principal executive or ranking elected official for a public agency. For Class II, the person described above should sign, or a representative duly authorized in writing.	This volume, Section 2.9 and UIC Application Form 4.	
V. Level of Justification The most significant tasks in approving an aquifer exemption request are defining the aquifer, delineating its boundaries (including confining zones), and justifying the need for the exemption. A guide to the evidence is outlined in the following checklist. This checklist is provided solely for use as an aid in preparing and reviewing aquifer exemption requests. Refer to 40 CFR 144.7 for general provisions; to 40 CFR 146.04, for criteria and standards applicable to aquifer exemptions. Data and other evidence which are used to support the aquifer exemption request must be included with the application.	V. Magma Level of Justification The following table is added to aid the EPA in reviewing the Magma Aquifer Exemption Request for a Minor Exemption. The left side of the page was extracted from EPA Region IX document dated March 1993 entitled "Aquifer Exemption Guidance."	

Table 3.2-1. Form 4 - Underground Injection Control (UIC) Permit Application - Information Summary		
Information Requirement	**Information Location**	**Comments**
Economic analyses shall be done in a precise, detailed, and representative manner.		
Maps required for the aquifer exemption application are in addition to any maps required in other applications (e.g., permit applications). Other information required for the aquifer exemption request that is available as part of an accompany permit application may be incorporated by reference.		

NA - Not applicable

FIGURES

4

SECTION 4.0

REFERENCES

1. Arizona Department of Environmental Quality (ADEQ), Aquifer Protection Permit Application Guidance Manual, Mod. September 11, 1991.

2. Arizona Department of Water Resources (ADWR), Well Registry Files and Driller's Logs in the Florence Project Area. 1995.

3. Beer, K.E., A Ground-water Survey and Predictive Model for the Town of Florence, Arizona, M.S. Thesis, University of Arizona, 105 p. 1988.

4. Conoco Copper Project, Florence, Arizona, Phase III Feasibility Study: Volume III, Hydrology, Geology, and Ore Reserves: Conoco Minerals Department. 1976.

5. Errol L. Montgomery and Associates (Montgomery), Hydrogeologic Investigation for Prefeasibility Studies for Florence Project, Magma Copper Company, Pinal County, Arizona. Tucson, Arizona. February, 1994.

6. Hardt, W.F. and Cattany, R.E., Description and Analysis of the Geohydrologic System in Western Pinal County, Arizona; U.S. Geological Survey Open-File Report 65-68. 1965.

7. U.S. Code of Federal Regulations, Title 40-Protection of the Environment; Chapter I-Environmental Protection Agency; Subchapter D-Water Programs; Parts 144-146-Underground Injection Control Program. July 1, 1986.

8. U.S. Congress, Safe Drinking Water Act of 1974, Public Law 93-523, December 14, 1974, and Subsequent Amendments.

9. U.S. Environmental Protection Agency (USEPA), Region IX Aquifer Exemption Guidance. March, 1993.

A

CBI

CONFIDENTIAL BUSINESS INFORMATION

VOLUME I OF V

INTRODUCTION AND REQUIRED ELEMENTS

MAGMA FLORENCE IN-SITU PROJECT
UNDERGROUND INJECTION CONTROL APPLICATION

APPENDIX A

PRE-FEASIBILITY STUDY FLORENCE PROJECT
MAGMA COPPER COMPANY
EXECUTIVE SUMMARY

Information contained in Appendix A has sensitive business information concerning unit costs, revenue forecasts, and other similar information of a proprietary nature that if released to the public may have an adverse financial impact on the Magma Copper Company.

JANUARY 1996

MAGMA

MAGMA COPPER COMPANY
Florence, Arizona

APPENDIX A

PRE-FEASIBILITY STUDY FLORENCE PROJECT
MAGMA COPPER COMPANY
EXECUTIVE SUMMARY

Please refer to the additional binder for Appendix A.

Copies of the designs and full size drawings (contained in tubes) can be found at:

Arizona Department of Environmental Quality, Phoenix, Arizona
U.S. Environmental Protection Agency, San Francisco, California
Magma Copper Company, Tucson, Arizona

B

APPENDIX B

SECTION 5, VOLUME I

AQUIFER PROTECTION PERMIT APPLICATION

SECTION 5.0

COMPLIANCE WITH AQUIFER WATER QUALITY STANDARDS

5.1 COMPLIANCE MONITORING STRATEGY

Magma Copper Company's (Magma's) proposed monitoring program is designed to ensure that the Aquifer Water Quality Standards (AWQS) will be protected in the manner prescribed in A.R.S. §§ 49-241 through 49-249. The program takes into account site characteristics, facility design, existing groundwater quality, and existing and future uses of the groundwater.

Information presented in Section 4.0 of this volume describes the control technologies that have been selected to eliminate discharges from surface facilities and to establish hydraulic controls for the in-situ mining operations that will ensure protection of the AWQS at the points of compliance (POCs) during the operating and post-closure phases of the facility.

Information presented in Section 6.0 of this volume describes methods that will be used to monitor facility operations and the steps that will be taken in the event of an AWQS exceedance or in the event that the AWQS are threatened.

The closure and post-closure plans presented in Section 7.0 of this volume describe steps that will be taken to clean and/or remove all surface components of the facility except the tailings ponds and to properly close the wells used in the in-situ mining operation. As closure is accomplished, the hydraulic controls that existed during operations will cease and the leached zones will be allowed to return to equilibrium with the surrounding aquifer.

The Groundwater Monitoring Plan presented in Volume III of this application is designed to present accurate data regarding the quality of groundwater at the POC. The location and design of the wells located, or proposed to be located, at the proposed POC have been selected after completing detailed simulation analyses presented in Volume IV of this application. Those analyses took into account the proposed design of the in-situ mining operation and the hydrogeologic features of the area as reported in Volume II of this application.

5.2 POINTS OF COMPLIANCE

5.2.1 Pollutant Management Area (PMA)

Pursuant to A.R.S. § 49-244, the POC for hazardous substances and the limit of the Pollutant Management Area (PMA) are identical. The PMA is defined as the horizontal boundary of an individual discharging unit or an imaginary line circumscribing several discharging activities. Under certain circumstances, the Arizona Department of Environmental Quality (ADEQ) director may establish POC for nonhazardous substances up to 750 feet outside a PMA.

The PMA for the facility as it will exist during the operational phase is shown on Figure 5.1-1(I). As closure activities proceed as described in Section 7.0 of this volume, the PMA surrounding the SX/EW plant will contract and eventually encompass only the tailing ponds which are proposed to be closed with sediment remaining in place. The facility will then contain two PMAs, one encompassing the tailings ponds and the other encompassing the in-situ mine area.

5.2.2 Discharge Impact Area (DIA)

Discharge Impact Area (DIA) is defined at A.R.S. § 49-201.11 as the potential areal extent of pollution migration, as projected on the land surface, as the result of a discharge from a facility. As reported in Volume IV of this application, detailed studies using groundwater flow and solute transport models were used to evaluate the potential impacts of the in-situ mining operations. (Although the proposed impoundments are considered "discharging" facilities pursuant to A.R.S. § 49-241.B, they have been designed to have no discharges.) The studies covered the full extent of the proposed operation, all closure activities, and the 30-year post-closure period. They were used in the location and design of the monitoring wells described in Table 5.2-1 below.

The modeling studies indicate that hydraulic controls can be maintained during the mining operations such that groundwater will flow into, not out of, the leach zone. The hydraulic controls thereby assure that the leaching activities will not contribute to AWQS exceedance during the period of facility operations.

The models were also used to evaluate DIA during the 30-year post-closure period when there will be no hydraulic controls. The outer limit of the 30-year DIA is shown on Figure 5.1-1(I). It is shown as a function of sulfate distribution because sulfate is the predominate anion in the leachate stream. (See Table 4.3-1 for estimated composition of solution after attenuation after block wash.) The models indicate that the AWQS for hazardous substances will be maintained through the 30-year post-closure period and that the maximum limit of the DIA will shift northward no more than 1,700 feet during the 30-year period.

The low concentrations of hazardous and non-hazardous substances in the solutions remaining in the leached zone after closure and the slow movement of the plume (less than 1,700 feet during the 30-year post-closure period) provides assurance that the mine activity will present little threat to the surrounding aquifer during the post-closure period and beyond. In the event that elevated concentrations are seen at the POC wells during the post-closure period, there will be adequate opportunity to alert downstream users, take additional samples, and if needed, install additional samples wells outside the PMA as indicated in the post-closure plan described in Section 7 of this volume.

5.2.3 Proposed POC Monitoring Well System

In consideration of the anticipated lateral extent of the project DIA, the control technologies employed, and the hydrogeologic characteristics of the Magma Florence site, the following POC strategy and monitoring well configuration is proposed:

- Establish POC monitoring wells along the western and northern boundary of the in-situ mine area for use during the operational and post-closure periods. As depicted in Figure 5.2-l(I) and listed in Table 5.2-1, use of 20 monitoring wells screened in either the Lower Basin-Fill Unit (LBFU) or the Oxide Bedrock Zone along the proposed extent of the POC is proposed. This well array is located downgradient from the proposed in-situ leaching activity under ambient groundwater conditions, with all wells located within 400 feet of the boundary of the ore body slated for mining. Of the 20 proposed POC wells, eleven are currently in place and nine are planned.

- The selection of the lateral position of the proposed wells, and the intercept of the screened intervals has taken into consideration the need to monitor the flow of groundwater along the two principal fault systems (The Sidewinder and the Party Line faults), with screens also placed in two apparent structural features that traverse the western boundary of the in-situ mine area. The vertical distribution of well screens in the LBFU is designed to monitor water quality in both the upper and lower strata of the unit.

- Use of the well set described above to monitor a suite of indicator water quality parameters for the detection of excursions of both hazardous and nonhazardous constituents of the process solutions throughout the operational and closure phases of the project. If a release of a nonhazardous analyte is confirmed through the assessment of water chemistry from the primary well suite, then Magma proposes that the Arizona Department of Environmental Quality (ADEQ) consider the subsequent selection of appropriate nonhazardous POC wells in downgradient locations that will ensure the protection of future uses of the overlying aquifer. It is anticipated that these response POC wells would be located no further downgradient than the project property line, to a maximum distance of 1/2 mile from the boundary of the in-situ mine area.

- Placement of two wells downgradient and northwest of the proposed SX/EW facility and the evaporation/tailings ponds (wells F and G on Figure 5.2-1[I]). These wells would contain screens that intercept the upper 100 feet of the Upper Basin-Fill Unit (UBFU), from the water table downward. These wells are proposed as a means of monitoring the performance of the discharging surface facilities. The operational detection monitoring in these wells would essentially be the same as that established for the POC wells flanking the in-situ well field.

- Upon completion of the post-operational closure period, Magma proposes that ADEQ consider the relocation of the non-hazardous POC to the downgradient fringe at the post-closure DIA depicted on Figure 5.1-1(I). During the 30-year post-closure period, compliance to hazardous constituent standards would be demonstrated at the wells depicted on Figure 5.2-1(I).

- Inclusion of four well installations in the upper alluvial overlying the oxide ore (wells M2-GU, M3-GL, M4-0 and H) to monitor groundwater quality upgradient from the mine operations. These wells are positioned to intercept the appropriate geologic units in regards to the potential for impacts to water quality that could occur downgradient from each location.

5.3 GROUNDWATER QUALITY MONITORING PROGRAM

The proposed program for monitoring groundwater quality during mining operations is presented in this section. The discussion is focused on information goals, network design, data analysis, and reporting. Procedural aspects of the program, including sampling protocols, quality assurance/quality control (QA/QC), and data management, are described in the Groundwater Sampling and Analysis Plan presented in Volume III. The groundwater sampling and analysis plan has been revised and commented upon by ADEQ and EPA. Revisions were made based upon those recommendations and are included in the plan. Other topics related to the compliance monitoring program that are discussed elsewhere are as follows:

Topic	Section
Proposed points of compliance	Volume I, Section 5.2
Contingency plan for exceedance of groundwater compliance levels	Volume I, Section 6.3
Post-closure groundwater monitoring program	Volume I, Section 7.3
Monitoring well design and construction	Volume II, Section 2.3
Water level measurements	Volume II, Section 2.3
Baseline monitoring program	Volume II, Section 4.5

5.3.1 Legal Authority

Significant legislative and regulatory provisions governing groundwater compliance monitoring for Aquifer Protection Permits (APP) in Arizona are listed below.

Document Name	Section Number	Section Name
Arizona Revised Statutes	49-221	Water quality standards in general
Arizona Revised Statutes	49-223	Aquifer water quality standards
Arizona Revised Statutes	49-244	Point of compliance
Arizona Administrative Code	R18-9-110	Individual permit conditions: alert levels
Arizona Administrative Code	R18-9-112	Individual permit conditions: monitoring requirements
Arizona Administrative Code	R18-9-113	Individual permit conditions: reporting requirements
Arizona Administrative Code	R18-9-114	Individual permit conditions: contingency plan requirements
Arizona Administrative Code	R18-11-405	Narrative aquifer water quality standards
Arizona Administrative Code	R18-11-406	Numeric aquifer water quality standards: drinking water protected use

5.3.2 Information Goals

Information goals form the basis for development of the proposed groundwater monitoring program. A three step process, described by Adkins et al. (1995[1]), was used to identify information goals. First, regulatory information goals (RIGs) were identified by reviewing laws and regulations. Monitoring information goals (MIGs) were then established to meet the regulatory goals. Finally, when statistical methods are chosen to achieve the monitoring goals, specific statistical information goals (SIGs) will be prepared.

RIGs are broad, qualitative statements that describe the underlying motives for conducting monitoring. They tend to address general objectives rather than the specifics of monitoring. MIGs are designed to be as specific as possible, but like RIGs, are stated in purely qualitative terms. MIGs are narrative statements that describe exactly why monitoring is being conducted. SIGs are quantitative, as well as specific. They describe the mechanics of how statistics will be used to extract information from data.

The following regulatory information goals were identified for the compliance monitoring program:

- Protect public health and the environment.
- Ensure protection of all current and reasonably foreseeable future uses of the aquifer.
- Determine compliance with water quality standards.
- Obtain early warnings that may indicate potential violations of water quality standards.
- Ensure compliance with Aquifer Protection Permit conditions.
- Evaluate the effectiveness of actions taken to mitigate the impacts of any exceedances in water quality that may occur.

The following monitoring information goals were identified for the compliance monitoring program:

- Monitor concentrations of constituents that will be the most likely to indicate an increased potential for exceedance of Aquifer Quality Limits (AQLs).
- Become aware of any exceedances of AQLs as soon as possible.

[1] In: The Role of Data Analysis Protocols in Obtaining Groundwater Quality Management Information; Procedures for the International Union of Geodesy and Geophysics, XXI General Assembly, Boulder, Colorado, July 2 to 14, 1995.

- Monitor all hydrogeologic units where contamination from mining operations could potentially occur.

- Concentrate monitoring efforts in the hydrogeologic units where the effects of mining are the most likely to occur (e.g. near the oxide/basin-fill contact).

- Monitor in the lateral portion of the aquifer where the effects of mining are the most likely to occur (e.g. downgradient of mining operations).

Statistical information goals will be developed when statistical methods are chosen.

5.3.3 Determination of Compliance Levels and Verification of Compliance Level Exceedances

The statistical approach for determining compliance levels has not been finalized. In general, statistical methods will be proposed that (1) are appropriate for the data distributions, (2) will maximize power and minimize the occurrence of false positives, and (3) will minimize the effects of spatial and temporal correlation. Statistical principles that will be used for determining compliance levels and verifying compliance level exceedances are outlined in Appendix F of Volume I.

Tables 5.3-1 and 5.3-2 show which water quality variables would have alert levels (ALs) and which would have AQLs. In general, alert levels would be assigned to those variables that can serve as indicators for potential AQL exceedances, and AQLs would be assigned to variables that have AWQSs.

5.3.4 Compliance Monitoring Locations

All 22 hazardous POC wells identified in Table 5.2-1 will be monitored on a quarterly basis during mining operations and closure. The rationale for choosing the proposed POCs is presented in Section 5.2 of this volume, and Section 5.0 of Volume II.

5.3.5 Water Quality Variables to be Measured

Two sets of chemical water quality variables, Level 1 and Level 2, were selected for compliance monitoring at the hazardous POCs (Tables 5.3-1 and 5.3-2). Level 1 variables will be monitored on a quarterly basis to provide early warning of potential AQL exceedances. Level 2 variables will monitored annually regardless of the results of Level 1 monitoring. In addition, Level 2 variables will be monitored quarterly if alert levels are exceeded for Level 1.

Level 1 variables were chosen based on their ability to provide early warning of potential AQL exceedances. Effective "early warning" indicators should have the following characteristics:

- Relatively high mobility and low attenuation.

- Provide sufficient warning of potential AQL exceedances.

- Occur in a significantly higher concentration in mining impacted groundwater than in unimpacted groundwater.

Fluoride, magnesium, sulfate and total dissolved solids were chosen as the four water quality variables that best meet these criteria based on water quality information presented in Volumes I, III, and IV.

Level 2 water quality variables are assigned to one of three categories. The first category, "selected constituents with AWQSs", consists of all inorganic chemicals with AWQSs that have the potential to exceed those standards due to mining activities. Asbestos, cyanide, nitrate, and nitrite were not included because they are not present in the mining solution and cannot result from the mining process. Fluoride was not included because it is a Level 1 indicator parameter.

Radionuclides, the second category of water quality variables in Level 2, consists of radionuclides that are used in calculations to determine compliance with Arizona numeric aquifer water quality standards (A.A.C R18-11-406). The third category of water quality variables primarily consists of cations and anions that will be used for quality control purposes.

5.3.6 Sampling Frequency

In general, sampling will be conducted quarterly or annually during operational compliance monitoring. The determination of which months form the four quarters will be determined after baseline data has been evaluated for seasonality. As more information is obtained on water quality and hydrogeology, it may become evident that sampling frequencies in some wells should be modified on either a temporary or permanent basis. Proposed changes in sampling frequencies will be carefully reviewed by Magma and submitted to ADEQ for approval prior to implementation.

As stated previously, Level 1 variables will be monitored on a quarterly basis to provide early warning of potential AQL exceedances. Level 2 variables will monitored annually regardless of the results of Level 1 monitoring. In addition, Level 2 variables may be monitored quarterly if alert levels are exceeded for Level 1 variables.

Annual monitoring of Level 2 constituents will help to ensure that the Level 1 indicator parameters are providing adequate warning of potential AQL exceedances. In addition, annual monitoring will provide an ongoing record of water quality that will be unaffected by seasonality (assuming that sampling will be conducted at approximately the same time each year).

If new wells are constructed for compliance monitoring, they will be sampled monthly for 1 year (or quarterly for 2 to 3 years) to obtain data for establishing compliance limits.

5.3.7 Data Analysis

There are several applications where data analysis will be conducted for the groundwater compliance monitoring program; evaluation of baseline data, calculation of compliance levels, determination of exceedance of compliance levels, and summarization of compliance monitoring data. Each application is described below.

After all 12 months of baseline water quality data are collected, descriptive statistical methods will be used to characterize the data. Temporal and spatial variability, central tendency, and distributional shape will be examined. The data will also be evaluated for the presence of seasonality and, based on that evaluation, sampling quarters will be defined.

Baseline data collected from the proposed POC wells will be used to calculate ALs and AQLs. As mentioned previously, statistical methods chosen to calculate compliance levels will be appropriate for the data distributions, will maximize power and minimize the occurrence of false positives, and will minimize the effects of spatial and temporal correlation. Statistical methods will also be used to determine if compliance levels have been exceeded. Statistical principles that will be used for determining compliance levels and verifying compliance level exceedances are outlined in Appendix F.

Descriptive statistical methods will be used to define the characteristics of compliance monitoring data. On an annual basis, the data will be summarized using simple data analysis procedures such as time-concentration plots and boxplots. The purpose of the evaluation will be to convey general information about water quality that is difficult to obtain from tabulated data.

5.3.8 Reporting

A groundwater compliance monitoring report will be submitted after each quarterly sampling period. The report will be submitted to ADEQ by the last day of the first month following each quarter. For example, if a quarter included February, March, and April, the report will be submitted by May 31. The report will include the following information:

- Sampling data (location of sample, date and time of sample collection, sampler's name, chain of custody forms).
- Field data (pH, specific conductance, temperature, purge volume, and relevant field notes).
- Laboratory data (laboratory name, sample analysis date, analysis method, and analytical results).
- Description of variances, if any, from the Sampling and Analysis Plan.
- Description of verification analysis or sampling, if any, that occurred within the last quarter.
- Descriptive statistics of water quality data (annually).

If an AL exceedance is verified, a report will be submitted to ADEQ within 30 days after verification of the exceedance. The report will include the following information:

- Either a demonstration that the cause of the AL exceedance is not the result of the permitted facility activities; or

- A description of the causes, impacts, or mitigation of the discharge.

If an AQL exceedance is verified, a report will be submitted to ADEQ within 30 days after verification of the exceedance. The report will include the following information:

- A description of the exceedance and its cause.

- The period of exceedance, including exact date(s) and time(s), if known, and the anticipated time period during which the exceedance is expected to continue.

- Any action taken or planned to mitigate the effects of the exceedance, or to eliminate or prevent recurrence of the exceedance.

- Any monitoring activity or other information which indicates that any pollutants would be reasonably expected to cause a violation of an AWQS.

- Any malfunction or failure of pollution control devices or other equipment or process.

5.4 PRESENT AND ANTICIPATED FUTURE AQUIFER USAGE

Detailed descriptions of present groundwater usage in the 100-square mile Florence project area and the proposed in-situ mine area are presented in Volume II, Sections 3.9 and 4.6, respectively, of this application. The Florence Project Area is located on the northern boundary of the Eloy subbasin within the Pinal Active Management Area (AMA). Arizona Department of Water Resources (ADWR) Second Management Plan, 1990-2000, Final Active Management Area, 289 p., January, 1991. Approximately 80 percent of the Pinal AMA population resides in the Eloy basin. Approximately 50 percent of agricultural activity in the Pinal AMA also occurs in the Eloy subbasin.

Presently approximately 382 registered wells (ADWR, 1995) are located within a 5-mile radius of the proposed in-situ mine area (Sheet 1.1-1[I]), approximately 65 percent of which withdraw groundwater. The majority of groundwater is used for irrigation, primarily by the San Carlos Irrigation Project (SCIP), which is used to supplement surface water derived from the Gila River. A total of 22 SCIP wells are located within the 100-square mile Florence Project Area which pump an average of 13,200 acre-feet of groundwater each year. Three irrigation wells in close proximity to the proposed in-situ mine area are planned to be abandoned and relocated prior to commencement of mining activities. The proposed in-situ mining operations will not affect agricultural groundwater withdrawals in the area. Thirteen irrigation wells not operated by SCIP (private wells) are located within 1 mile of the proposed in-situ mine area, which withdraw approximately 4,385 acre feet annually.

The Town of Florence operates five public water supply wells in and around the Florence Project Area. Two wells are located approximately 2.5 miles east and two are located approximately 3 miles south of the proposed in-situ mine area (see Sheet 1.1-1[I]). The Arizona Department of Corrections operates two public supply wells located approximately 2.5 miles south and 3 miles east of the proposed in-situ mine area. These seven municipal water supply wells pump an average of 1,722 acre feet of groundwater each year. All of these public supply wells are generally hydraulically upgradient from the proposed in-situ mine area and will not be affected by proposed mining operations.

Approximately 134 private domestic wells are located within the 100-square mile Florence Project Area which pump an average of 52 acre feet of groundwater annually. This is about 2 to 3 percent of the total groundwater use in the area. Two private domestic wells are located within 1 mile of the proposed in-situ mine area but are not used for drinking water due to the high nitrate levels. These wells are located on Magma lands and the users use bottled water for consumptive purposes. These wells are operated by Magma and will not be used for domestic purposes during mining operations. Private domestic wells in the model area will not be affected by proposed in-situ mining operations.

As the result of groundwater management practices implemented in the Pinal AMA, ADWR (1991) predicts that irrigation efficiency will increase 10 to 40 percent. This, combined with retirement of agricultural lands and substitution of approximately 50 percent of present groundwater used for agriculture with Central Arizona Project Water, will greatly reduce groundwater usage associated with agriculture.

Domestic groundwater use will increase in the next 10 to 20 years. The Town of Florence has projected a residential growth rate of 74 percent over the next 15 years, and combined residential and institutional growth rate of 54 percent. It is anticipated that this could increase groundwater usage from the current amount of 1,722 acre-feet to 3,602 acre-feet.

Groundwater withdrawals associated with proposed in-situ mining operations are estimated to be to 1,293 acre-feet annually occurring over a period of approximately 15 years from the beginning of mining activities. Overall groundwater withdrawals are expected to generally remain similar to current amounts or decline slightly. Proposed in-situ mining operations are not expected to influence groundwater withdrawals in the future and in fact groundwater use will be reduced during the life of mine as over 200 acres will be taken out of agricultural use.

Table 5.2-1 Proposed Point of Compliance and Upgradient Monitoring Wells - Well Location, Construction, and Lithology

Existing or Planned	Well ID	Latitude/ Longitude	Total Depth (ft)	Unit Screened	Casing		Screen			Annular Seal		Surface Elevation (ft)	Reference Point Elevation (ft)	Depth Center of Screened Interval (ft)	Distance from Center of Screen to Geologic Contact	
					Diameter and Type (O.D. in.)	Interval (ft)	Diameter and Type (O.D. in.)	Interval (ft)	Length (ft)	Type	Interval (ft)				Geologic Contact	Distance[d] (ft)
Point of Compliance Wells																
E[b]	M6-GU	33°3' 15"N 111°26' 9.7"W	590	LBFU	5 9/16 LCS[a] 5 9/16 PVC	-1.45 to 0 -1.2 to 524	5 9/16 PVC	524 to 563	39	Cement Bentonite	0 to 150 150 to 500	1480.5	1481.72	543	UBFU/LBFU LBFU/Oxide	+263 -397
E[b]	M7-GL	33°3' 14.8"N 111°26' 9.5"W	940	LBFU	5 9/16 LCS 4 1/2 LCS	-1.0 to 593 593 to 859	4 1/2 PVC	859 to 928	69	Cement	0 to 838	1480	1480.95	898	UBFU/LBFU LBFU/Oxide	+828 -42
E[b]	M8-O	33°3' 14.7"N 111°26' 10.1"W	1110	Oxide	5 9/16 LCS 4 1/2 LCS	-1.4 to 591 591 to 1011	4 1/2 PVC	1011 to 1070	59	Cement	0 to 970	1479.1	1480.46	1040	LBFU/Oxide Oxide/Sulfide	+100 -480
E[b]	M14-GL	33°3' 3.7"N 111°26' 13.3"W	950	LBFU	5 9/16 LCS	-1.8 to 778	5 9/16 PVC	778 to 838	60	Cement Bentonite	0 to 17 17 to 748	1472.8	1474.58	808	MFGU/LBFU LBFU/Oxide	+524 -72
E[b]	M15-GU	33°3' 3.8"N 111°26' 13.9"W	630	LBFU	5 9/16 LCS 5 9/16 PVC	-1.4 to 19 19 to 554	5 9/16 PVC	554 to 594	40	Cement Bentonite	0 to 20 20 to 533	1472.6	1474.01	574	MFGU/LBFU LBFU/Oxide	+290 -306
P[c]	B_{OX}	33°3' 4.3"N 111°26' 13.3"W	1150	Oxide	5 9/16 LCS	0 to 930	5 9/16 PVC	930 to 1130	200	Cement Bentonite	0 to 20 20 to 910	1472[e]	NA	1030	LBFU/Oxide	+150
E[b]	M16-GU	33°2' 50"N 111°26' 12.7"W	690	LBFU	5 9/16 LCS	-1.8 to 598	5 9/16 PVC	598 to 658	60	Cement Bentonite Cement	0 to 20 20 to 495 495 to 562	1464.3	1466.05	628	MFGU/LBFU LBFU/Oxide	+328 -452
E[b]	M17-GL	33°2' 49.5"N 111°26' 12.7"W	1130	LBFU	5 9/16 LCS	-1.8 to 938	5 9/16 PVC	938 to 998	60	Cement Bentonite	0 to 20 20 to 917	1464.4	1466.16	968	MFGU/LBFU LBFU/Oxide	+668 -112
P[c]	A_{OX}	33°2' 53.9"N 111°26' 12.6"W	1350	Oxide	5 9/16 LCS	0 to 1130	5 9/16 PVC	1130 to 1330	200	Cement Bentonite	0 to 20 20 to 1110	1464[e]	NA	1230	LBFU/Oxide	+150
E	P19.1-O	33°3' 12.9"N 111°25' 56"W	680	Oxide	6 5/8 PVC	-2.0 to 402	6 5/8 PVC	402 to 601	199	Cement Bentonite	0 to 20 20 to 370	1483	1484.72	501	LBFU/Oxide Oxide/Sulfide	+146 -169
E	O19-GL	33°3' 13"N 111°25' 58.3"W	460	LBFU	5 9/16 LCS 5 9/16 PVC	-1.6 to 19 19 to 375	5 9/16 PVC	375 to 435	60	Cement Bentonite	0 to 20 20 to 347	1481.7	1483.28	405	MFGU/LBFU LBFU/Oxide	+101 NA

Table 5.2-1 Proposed Point of Compliance and Upgradient Monitoring Wells - Well Location, Construction, and Lithology

Existing or Planned	Well ID	Latitude/ Longitude	Total Depth (ft)	Unit Screened	Casing Diameter and Type (O.D. in.)	Casing Interval (ft)	Screen Diameter and Type (O.D. in.)	Screen Interval (ft)	Screen Length (ft)	Annular Seal Type	Annular Seal Interval (ft)	Surface Elevation (ft)	Reference Point Elevation (ft)	Depth Center of Screened Interval (ft)	Distance from Center of Screen to Geologic Contact: Geologic Contact	Distance from Center of Screen to Geologic Contact: Distance[d] (ft)
Point of Compliance Wells																
E	P49-O	33°2' 41.8"N 111°26' 5.8"W	1288	Oxide	6 5/8 PVC	-2.0 to 808	6 5/8 PVC	808 to 1222	414	Cement Bentonite	0 to 20 20 to 760	1461.8	1463.12	1015	LBFU/Oxide Oxide/Sulfide	+250 NA
E	O49-GL	33°2' 41.7"N 111°26' 7.3"W	740	LBFU	5 9/16 PVC	-0.9 to 661	5 9/16 PVC	661 to 721	60	Cement Bentonite	0 to 20 20 to 610	1461.2	1462.08	681	MFGU/LBFU LBFU/Oxide	+381 -84
P[e]	C_{LBF1}	33°3' 16.4"N 111°26' 4.4"W	455	upper LBFU	5 9/16 LCS 5 9/16 PVC	0 to 20 20 to 355	5 9/16 PVC	375 to 435	60	Cement Bentonite	0 to 20 20 to 355	1485[e]	NA	405	UBFU/LBFU LBFU/Oxide	+80 -445
P[e]	C_{LBF2}	33°3' 16.4"N 111°26' 3.9"W	820	lower LBFU	5 9/16 LCS	0 to 740	5 9/16 PVC	740 to 800	60	Cement Bentonite	0 to 20 20 to 720	1485[e]	NA	770	UBFU/LBFU LBFU/Oxide	+445 -80
P[e]	C_{OX}	33°3' 16.4"N 111°26' 3.3"W	1120	Oxide	5 9/16 LCS	0 to 900	5 9/16 PVC	900 to 1100	200	Cement Bentonite	0 to 20 20 to 880	1485[e]	NA	1000	LBFU/Oxide	+150
P[e]	D_{LBF}	33°3' 12.94"N 111°25' 46.6"W	340	LBFU	5 9/16 LCS 5 9/16 PVC	0 to 20 20 to 315	5 9/16 PVC	315 to 330	15	Cement Bentonite	0 to 20 20 to 295	1485[e]	NA	322.5	MFGU/LBFU LBFU/Oxide	+12.5 -27 5
P[e]	D_{OX}	33°3' 12.9"N 111°25' 46.1"W	585	Oxide	5 9/16 LCS 5 9/16 PVC	0 to 20 20 to 400	5 9/16 PVC	400 to 550	150	Cement Bentonite	0 to 20 20 to 380	1485[e]	NA	475	LBFU/Oxide Oxide/Sulfide	+125 -100
P[e]	E_{LBF}	33°3' 12.9"N 111°25' 36.9"W	340	LBFU	5 9/16 LCS 5 9/16 PVC	0 to 20 20 to 310	5 9/16 PVC	310 to 330	20	Cement Bentonite	0 to 20 20 to 290	1480[d]	NA	320	MFGU/LBFU LBFU/Oxide	+20 -30
P[e]	E_{OX}	33°3' 12.9"N 111°25' 36.4"W	535	Oxide	5 9/16 LCS 5 9/16 PVC	0 to 20 20 to 400	5 9/16 PVC	400 to 500	100	Cement Bentonite	0 to 20 20 to 380	1480[e]	NA	450	LBFU/Oxide Oxide/Sulfide	+100 -75
P[e]	F_{UBF}	33°3' 3.6"N 111°25' 20.5"W	245	UBFU	5 9/16 LCS 5 9/16 PVC	0 to 20 20 to 125	5 9/16 PVC	125 to 225	100	Cement Bentonite	0 to 20 20 to 105	1475[e]	NA	175	Alluvium/UBFU UBFU/MFGU	+95 -75
P[e]	G_{UBF}	33°3' 14.1"N 111°25' 6.2"W	240	UBFU	5 9/16 LCS 5 9/16 PVC	0 to 20 20 to 120	5 9/16 PVC	120 to 220	100	Cement Bentonite	0 to 20 20 to 100	1490[e]	NA	170	Alluvium/UBFU UBFU/MFGU	+90 -80

Table 5.2-1 Proposed Point of Compliance and Upgradient Monitoring Wells - Well Location, Construction, and Lithology

Existing or Planned	Well ID	Latitude/ Longitude	Total Depth (ft)	Unit Screened	Casing		Screen			Annular Seal		Surface Elevation (ft)	Reference Point Elevation (ft)	Depth Center of Screened Interval (ft)	Distance from Center of Screen to Geologic Contact	
					Diameter and Type (O.D. in.)	Interval (ft)	Diameter and Type (O.D. in.)	Interval (ft)	Length (ft)	Type	Interval (ft)				Geologic Contact	Distance[d] (ft)
Upgradient Monitoring Wells																
E[b]	M2-GU	33°2' 37"N 111°25' 18.3"W	270	UBFU	5 9/16 LCS 5 9/16 PVC	-1.8 to 18 18 to 198	5 9/16 PVC	198 to 237	39	Cement Bentonite	0 to 19 19 to 170	1459	1460.80	217	Alluvium/UBFU UBFU/MFGU	+147 -31
E[b]	M3-GL	33°2' 36.5"N 111°25' 18.5"W	370	LBFU	5 9/16 LCS 5 9/16 PVC	-1.9 to 19 19 to 298	5 9/16 PVC	298 to 338	40	Cement Bentonite	0 to 20 20 to 270	1458.8	1460.74	318	MFGU/LBFU LBFU/Oxide	+47 -53
E[b]	M4-O	33°2' 36.8"N 111°25' 18.5"W	510	Oxide	5 9/16 LCS 5 9/16 PVC	-1.7 to 19 19 to 405	5 9/16 PVC	405 to 464	59	Cement Bentonite	0 to 20 20 to 380	1458.9	1460.60	434	LBFU/Oxide Oxide/Sulfide	+64 -66
P[c]	H_{UBF}	33°3' 47.4"N 111°24' 33.2"W	245	UBFU	5 9/16 LCS 5 9/16 PVC	0 to 20 20 to 125	5 9/16 PVC	125 to 225	100	Cement Bentonite	0 to 20 20 to 105	1460[e]	NA	175	Alluvium/UBFU UBFU/MFGU	+95 -75

[a] LCS casing placed over the PVC at M6-GU to provide structural support for the dedicated pump.
[b] Wells have dedicated pumps installed.
[c] Planned well completion details estimated and subject to slight adjustment.
[d] Positive values represent distance above the center of the screened interval; negative values are below.
[e] Surface elevation estimated, the planned wells will be surveyed after completion.

LCS - Low Carbon Steel.
PVC - Polyvinyl Chloride.
SS - Stainless Steel
UBFU - Upper Basin-Fill Unit.
MFGU - Middle Fine-Grained Unit.
LBFU - Lower Basin-Fill Unit.
E - Existing well.
P - Planned well.
NA - Data not available.
All existing well screened intervals are sand packed with #6-9 Colorado silica sand to approximately 50 feet above the top of screened interval and 10 feet of #30 silica sand.

Table 5.3-1 Water Quality Variables - Level 1		
Water Quality Variables	**AL (mg/L)**	**Analytical Method**
Fluoride[a]	TBD	EPA 340.2
Magnesium	TBD	EPA 200.7
Sulfate	TBD	EPA 300
Total Dissolved Solids	TBD	EPA 160.1
pH	NA	EPA 150.1
Specific Conductance	NA	EPA 120.1
Temperature	NA	NA

[a]AQL to be determined

NA - Not applicable
TBD - To be determined
AL - Alert Level
AQL - Aquifer Quality Limit

Table 5.3-2 Water Quality Variables - Level 2		
WATER QUALITY VARIABLES	**AQL (mg/L)**	**Analytical Method**
Selected Constituents With AWQSs		
Antimony	TBD	EPA 200.7
Arsenic	TBD	EPA 206.2
Barium	TBD	EPA 200.7
Beryllium	TBD	EPA 200.7
Cadmium	TBD	EPA 200.7
Chromium	TBD	EPA 218.2
Lead	TBD	EPA 239.2
Mercury	TBD	EPA 245.1
Nickel	TBD	EPA 200.7
Selenium	TBD	EPA 270.2
Thallium	TBD	EPA 279.2
Radionuclides		
Gross Alpha	TBD	EPA 900.0
Gross Beta	TBD	EPA 900.0

Table 5.3-2 Water Quality Variables - Level 2		
Radium-226	TBD	EPA 901.1 or EPA 903/904
Radium-228	TBD	EPA 901.1 or EPA 903/904
Radon 222	NA	Emination 903 or Lucas (Cell)
Total Uranium (natural)	NA	908.0 or SM 7500
Other Variables		
Aluminum	NA	EPA 204.2
Bicarbonate	NA	EPA 310.1
Calcium	NA	EPA 200.7
Carbonate	NA	EPA 310.1
Cobalt	NA	EPA 200.7
Chloride	NA	EPA 300
Copper	NA	EPA 200.7
Iron	NA	EPA 200.7
Manganese	NA	EPA 200.7
Nitrate	NA	EPA 300
Silver	NA	EPA 200.7
Sodium	NA	EPA 200.7
Potassium	NA	EPA 200.7
Zinc	NA	EPA 200.7
TPH	NA	EPA 8015M
TRPH	NA	EPA 418.1

NA - Not applicable
TBD - To be determined
TPH - Total Petroleum Hydrocarbons
TRPH - Total Recoverable Petroleum Hydrocarbons
AQL - Aquifer Quality Limit

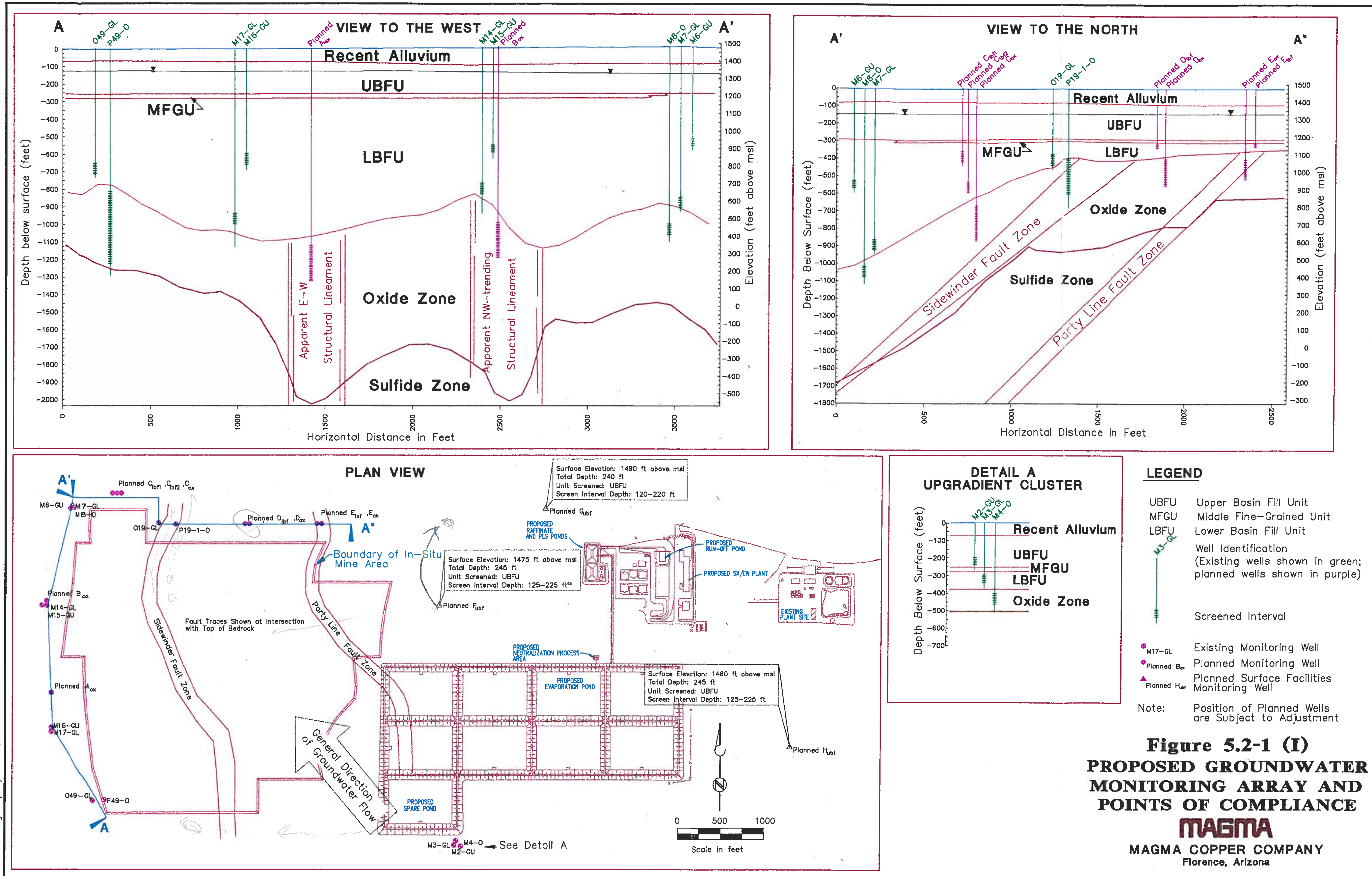


Figure 5.2-1 (I)
PROPOSED GROUNDWATER MONITORING ARRAY AND POINTS OF COMPLIANCE

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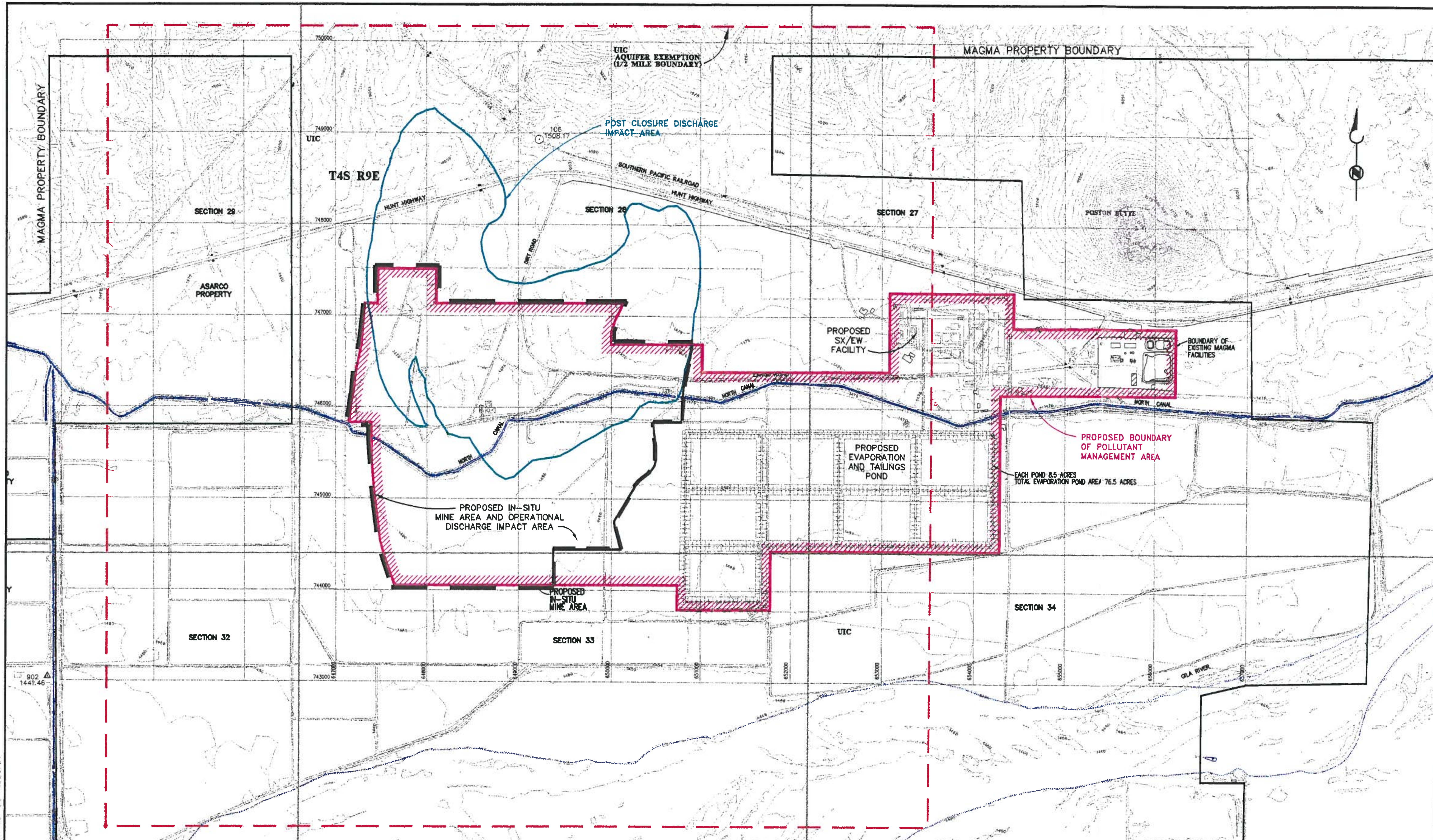
Florence, Arizona

outerx.dwg 01/06/96 GJC



NOTES:
POST CLOSURE IMPACT AREA REPRESENTS THE MAXIMUM EXTENT AT THE LOWEST DETECTABLE SULFATE LEVEL BASED ON NUMERICAL SIMULATIONS OF SOLUTE TRANSPORT PRESENTED IN VOLUME IV.

0 500 1000
SCALE IN FEET

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MAGMA COPPER COMPANY
Florence, Arizona

Figure 5.1-1 (I)
PROPOSED IN-SITU MINE AREA MAP SHOWING PROPOSED DISCHARGE IMPACT AREA AND POLLUTANT MANAGEMENT AREA

EXPLANATION

PW-4	= EXISTING WELL LOCATION	M1-GL	= MONITOR WELL LOCATION
015-0	= AQUIFER TEST AND OBSERVATION WELLS	164MF	= EXISTING COREHOLES

0 350 700
SCALE IN FEET

Sheet 2.1-2 (UIC)

GENERAL SITE DESIGN LAYOUT

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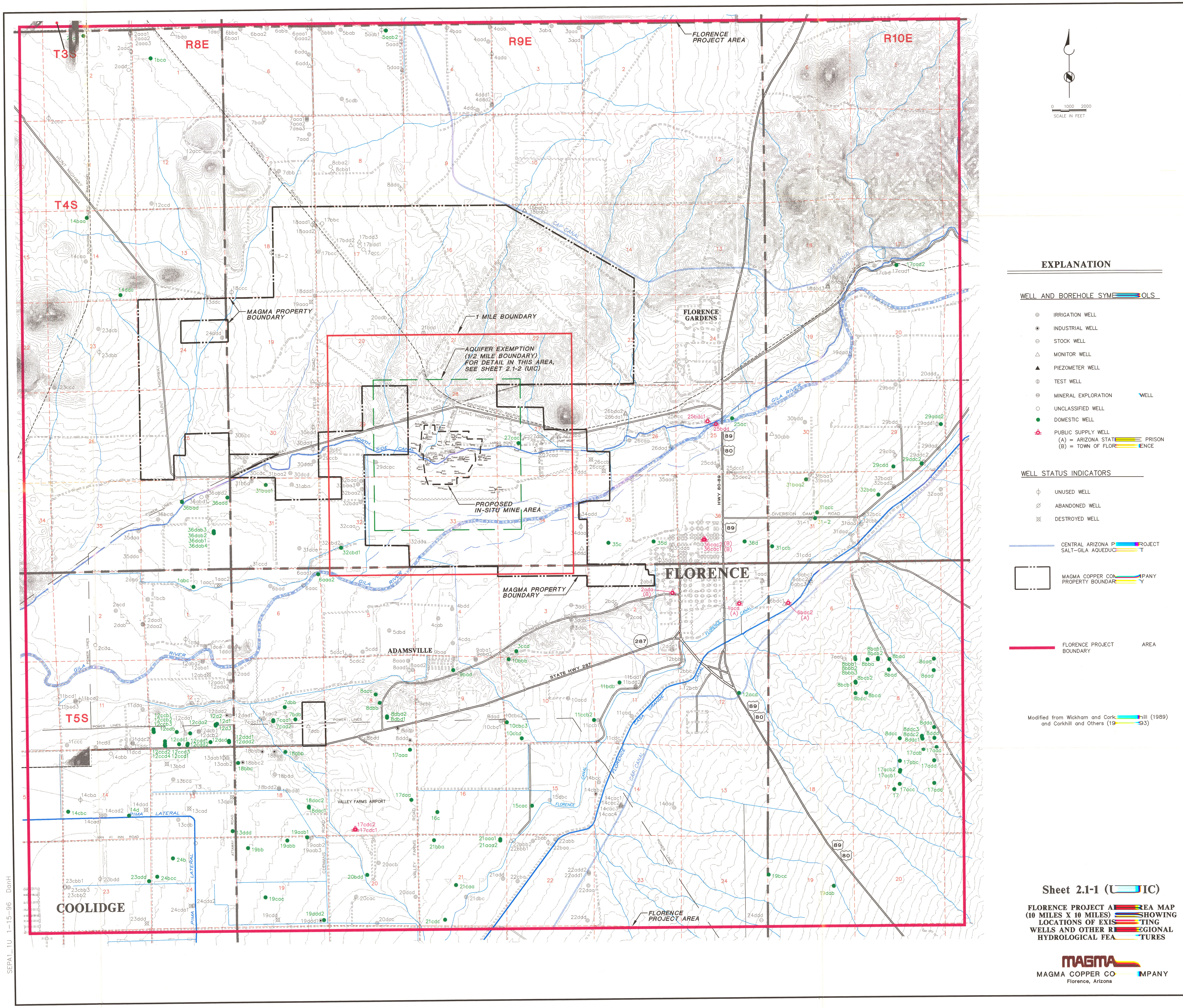

T3S
T4S
T5S
R8E
R9E
R10E
FLORENCE PROJECT AREA
MAGMA PROPERTY BOUNDARY
1 MILE BOUNDARY
AQUIFER EXEMPTION (1/2 MILE BOUNDARY) FOR DETAIL IN THIS AREA, SEE SHEET 2.1-2 (UIC)
PROPOSED IN-SITU MINE AREA
FLORENCE GARDENS
FLORENCE
ADAMSVILLE
COOLIDGE
GILA RIVER
NORTH SIDE CANAL
CAP CANAL
STATE HWY 287
HUNT HIGHWAY
SOUTHERN PACIFIC RAILROAD
DIVERSION DAM ROAD
VALLEY FARMS AIRPORT
PIMA LATERAL
FLORENCE CANAL
CASA GRANDE CANAL
HWY 80-89
SCALE IN FEET
0 1000 2000
EXPLANATION
WELL AND BOREHOLE SYMBOLS
IRRIGATION WELL
INDUSTRIAL WELL
STOCK WELL
MONITOR WELL
PIEZOMETER WELL
TEST WELL
MINERAL EXPLORATION WELL
UNCLASSIFIED WELL
DOMESTIC WELL
PUBLIC SUPPLY WELL
(A) = ARIZONA STATE PRISON
(B) = TOWN OF FLORENCE
WELL STATUS INDICATORS
UNUSED WELL
ABANDONED WELL
DESTROYED WELL
CENTRAL ARIZONA PROJECT SALT-GILA AQUEDUCT
MAGMA COPPER COMPANY PROPERTY BOUNDARY
FLORENCE PROJECT AREA BOUNDARY
Modified from Wickham and Corkhill (1989) and Corkhill and Others (1993)
Sheet 2.1-1 (UIC)
FLORENCE PROJECT AREA MAP (10 MILES X 10 MILES) SHOWING LOCATIONS OF EXISTING WELLS AND OTHER REGIONAL HYDROLOGICAL FEATURES
MAGMA
MAGMA COPPER COMPANY
Florence, Arizona
SEPA1_1U 1-15-96 DanH